

North Topsail Beach Shoreline Protection Project  
Final Environmental Impact Statement

**APPENDIX C**  
**Geotechnical Investigations**

**NORTH TOPSAIL BEACH, NORTH CAROLINA: MARINE SAND SEARCH  
INVESTIGATIONS TO LOCATE SAND SOURCES FOR BEACH NOURISHMENT**

**Prepared for:**

**Town of North Topsail Beach**

**Report Prepared by:**

**Principal Marine Geologist: Charles W. Finkl, Ph.D.**

**Project Manager: Tom Jarrett, P.E.**

**Geotechnical Project Manager: Jeffrey L. Andrews, PSM, CIH**

**Coastal Oceanographer: Lindino Benedet, M.Sc.**

**Project Geologist: Melany Larenas, P.G.**

**Geologist: Kenneth Willson, B.Sc.**

**Coastal Planning & Engineering of North Carolina, Inc.**

**4038 Masonboro Loop Rd**

**Wilmington, NC 28409**

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# NORTH TOPSAIL BEACH, NORTH CAROLINA, MARINE SAND SEARCH INVESTIGATIONS TO LOCATE SAND SOURCES FOR BEACH NOURISHMENT

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## **NORTH TOPSAIL BEACH, NORTH CAROLINA, MARINE SAND SEARCH INVESTIGATIONS TO LOCATE SAND SOURCES FOR BEACH NOURISHMENT**

### **INTRODUCTION**

An area on the inner continental shelf offshore North Topsail Beach, and in the channel section and ebb-tidal delta of New River Inlet, was surveyed in an effort to locate suitable sand sources for the North Topsail Beach Nourishment Project. A rational sequence of geotechnical and geophysical investigations, based on Coastal Planning & Engineering, Inc. (CPE) strategic sand search protocols as described in general by FINKL, ANDREWS and BENEDET (2003) and FINKL and KHALIL (2005), was adapted to local shelf conditions. These procedures featured analysis of historical data, understanding local coastal geological frameworks, comprehension of regional morphodynamics, and performing preliminary reconnaissance geophysical and geotechnical surveys that included on-the-fly analysis of geophysical data and vibrocores in the field. Application of these procedures resulted in the identification of beach-compatible sands infilling paleo (river) channels that cut into the underlying rock strata, which were interpreted by WILLSON (2009) to be parts of the Upper and Lower River Bend Formation, both members being Oligocene in age. Channel cutting on the inner shelf occurred during low stands of sea level. The channels were subsequently infilled with sandy materials reworked from the Upper and Lower River Bend Formation. In addition to offshore sand sources, suitable sandy sediments within the proposed design modification of the New River Inlet were also identified and characterized.

### **STUDY AREA AND COASTAL GEOLOGICAL FRAMEWORK**

The shape of the North Carolina coastal system reflects major differences in the underlying geological framework (RIGGS *et al.*, 1995). The 326-mile long coastline of North Carolina is separated by Cape Lookout into two distinct provinces. The southern province extends from Cape Lookout to Cape Fear (Figure 1). The embayment located between Cape Lookout and Cape Fear is Onslow Bay. Onslow Bay is underlain by Cenozoic era rock units (SNYDER *et al.*, 1982; SNYDER *et al.*, 1994; CLEARY *et al.*, 1996; WILLSON and CLEARY, 2003). These units are associated with the Carolina Platform, which underlies the region between Myrtle Beach, South Carolina and Cape Fear, North Carolina. This structural platform has undergone relative uplift over geologic time resulting in the truncation of the rock units by the migrating shoreface. Consequently, an erosional topography exists throughout Onslow Bay with only a thin veneer of sediment and widespread exposures of rock across the shoreface (RIGGS *et al.*, 1995).

MILLIMAN *et al.* (1972) classified the Onslow Bay shelf sediment cover as residual (derived from the erosion of underlying sediments and rocks). The sand-poor nature of the shoreface is associated with the thin veneer (several centimeters to < 2 meters in most areas) of Holocene sediment covering shallow Oligocene age rock units that frequently crop out on the seafloor as scarps or flat rock outcrops. Relatively low sediment input into Onslow Bay due to a lack of fluvial input and minimal sediment exchange between adjacent shelf embayments further exacerbates the situation (CLEARY and PILKEY, 1968; BLACKWELDER *et al.*, 1982). Topsail Island

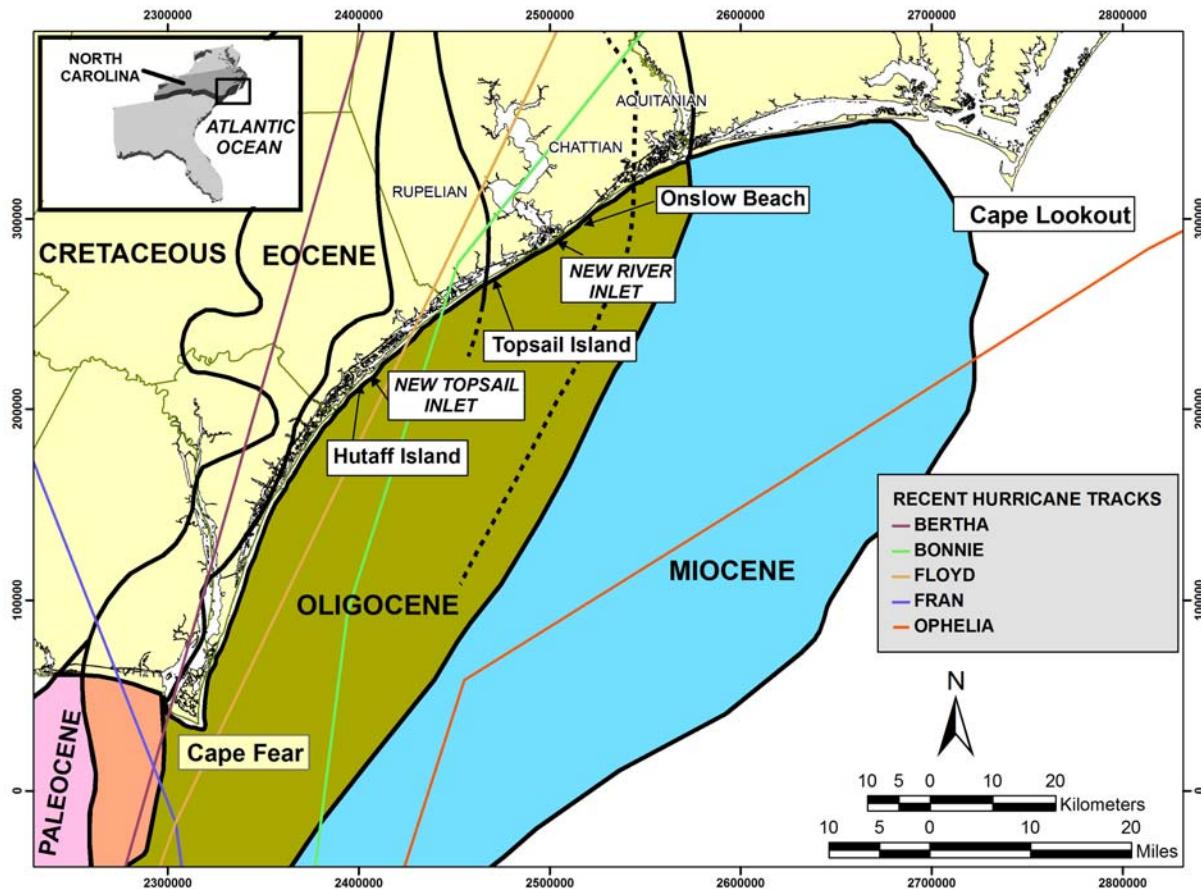


Figure 1. The Onslow Bay region of southeastern North Carolina showing generalized continental shelf geological units (After Snyder et al. 1994, and Willson, 2009), and the tracks of recent hurricanes (1996-2005).

is a 22-mile long barrier island located in the central portion of the Onslow Bay shoreline (Figure 2). The Island is bordered by New River Inlet to the north and New Topsail Inlet to the south. Three separate communities (North Topsail Beach, Surf City, and Topsail Beach) are situated on the Island. This study encompasses an area that extends from 1.8 km to 9.3 km (1 to 5 nautical miles) offshore of the towns of North Topsail Beach and Surf City located in the northern and central portions of Topsail Island, respectively (Figure 2).

### North Topsail Beach

North Topsail Beach comprises the northern 11.1 miles of Topsail Island (Figure 2). New River Inlet borders the town to the North. The natural realignment of the outer bar channel of New River Inlet in a more northeasterly orientation has promoted significant erosion of the beach and dunes along the northern end of the Island (CLEARY *et al.*, 2003). Since 1997, shoreline erosion has ranged from 45 ft. to 155 ft. along the northern 4,000 ft. of the Town. In May 2002, approximately 300,040 cy of material was dredged from the confluence of the Atlantic Intra-coastal Water Way and the New River and placed along the eroding shoreline in an attempt to mitigate the erosion. This was short lived with only a fraction of the material remaining after

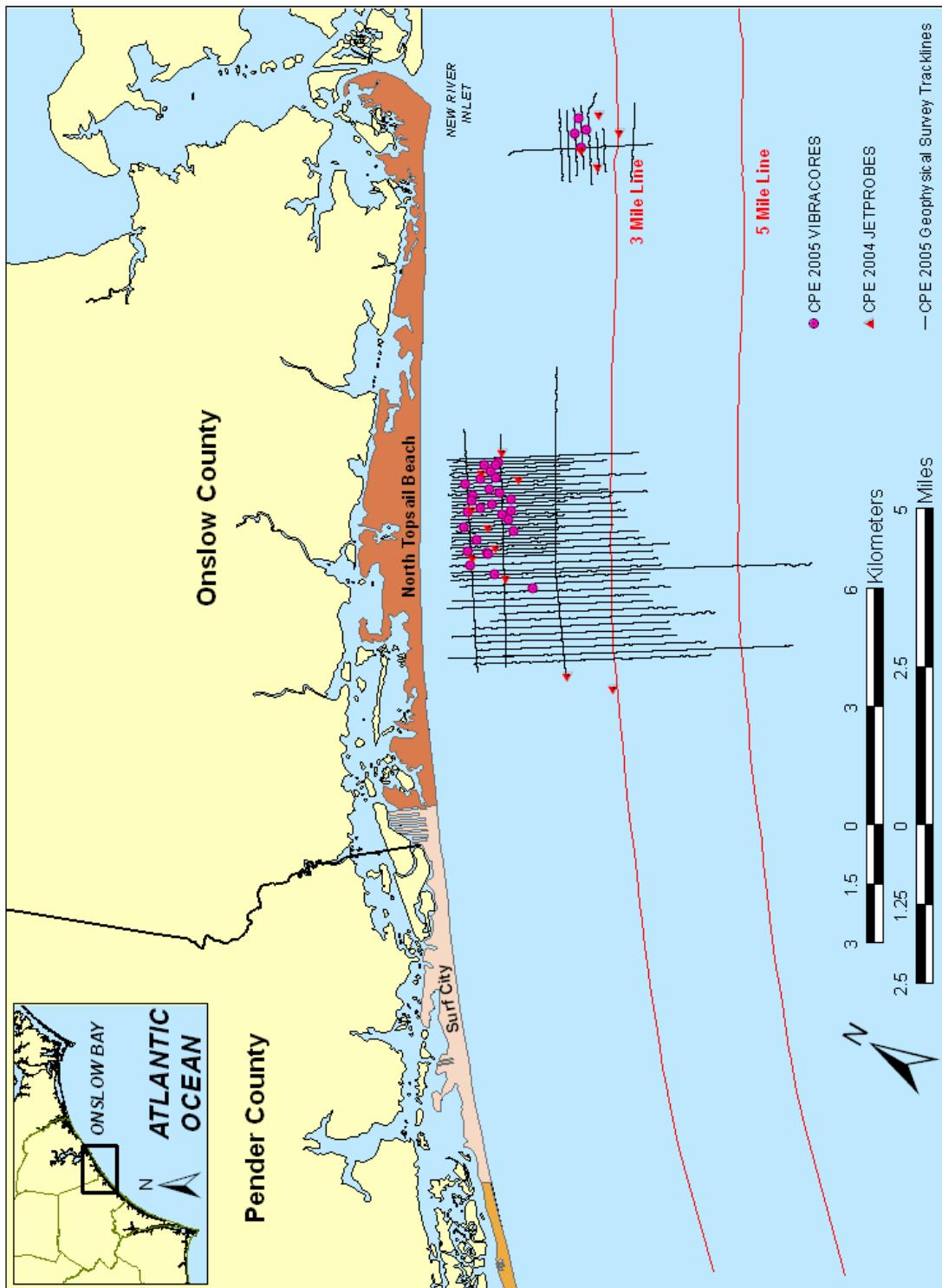


Figure 2. Location map of North Topsail Beach showing jet probe, vibracore, and geophysical trackline locations.

several winter storms. Similar routine maintenance events, subsequent to the 2002 effort, have done little to stem erosion on the northern end of the Island.

The town of North Topsail Beach also faces a different problem from many other communities in southeastern North Carolina due to the COASTAL BARRIER RESOURCE ACT of 1982. Enacted by the United States Congress, this legislation establishes Coastal Barrier Resource Act (CBRA) Zones for the purpose of "... minimizing the loss of human life, wasteful expenditure of federal revenues and the damage to fish, wildlife and other natural resources associated with the coastal barriers along the Atlantic and Gulf Coasts...". This legislation was implemented to restrict future federal expenditures and financial assistance that would have the effect of encouraging development of coastal barriers. Seven miles of the 11.1 miles shoreline of North Topsail Beach falls within a CBRA Zone. This is significant because for the town to consider a beach nourishment project within the CBRA Zone, it must secure funding without any federal contributions.

### **Inlet and Barrier Island Morphodynamics**

The southeastern coast of North Carolina is characterized by short barrier islands with an average length of 5 miles. The islands are separated by wave-dominated, mixed tidal inlets (HAYES, 1979) that have moderately well-developed ebb-tidal deltas. The barrier islands are migrating landward in response to rising sea level and a limited sediment supply. Barrier extremities typically exhibit pronounced shoreline changes (repositioning of shorelines) that are associated with tidal inlet processes (*e.g.* migration, channel switching, sediment bypassing, and opening/closing) (*cf.* FITZGERALD, 1984). Morphosedimentary patterns and geographic location of coastal barriers and inlets, along the North Carolina coast are influenced in part by the inherited geologic framework (*e.g.* MACINTYRE and PILKEY, 1969; RIGGS *et al.*, 1995). In addition to wave client, tidal regime, and frequency of storms, underlying rock structure tends to influence the geomorphology of coastal barriers as does composition of the bedrock in relation to offshore sediment sources.

Nineteen (19) inlets occur along the North Carolina coast. Four (4) of these are located north of Cape Lookout. Ten (10) are located in Onslow Bay. The remaining five (5), including the mouth of the Cape Fear River are found further south in Long Bay. The northern inlets are wave-dominated and have large flood tidal deltas. The tidal range is microtidal (0-7 ft.). The inlets south of Cape Lookout tend to be smaller and are dominated by a mix of tidal and wave processes. Many of these inlets are migratory in nature and may move at rates ranging from 33-328 ft./yr. The U.S. Army Corps of Engineers maintains many of the inlets in southeastern North Carolina for navigational purposes. Others remain in a natural state and are controlled by natural processes like sediment supply to the inlet system, tidal prism, wave action, and longshore currents. Inlets exert an influence on the areas immediately adjacent to them in different ways. They generally cause shoreline change. Areas where a link between shoreline change and inlet process can be identified, are termed "inlet hazard zones". These areas are designated by the North Carolina Coastal Area Management Act (CAMA) and are important areas of environmental concern (AEC).

New River Inlet has historically influenced the morphology and shoreline change of the northern 4000 ft. of North Topsail Beach. The improved hydraulic connections between the sounds, New River, and New River Inlet resulting from various navigation projects, particularly the construction of the AWW, appeared to substantially increase the tidal prism of New River Inlet (WILLSON and CLEARY, 2003). In addition to the modification of the hydrology of the Inlet through dredging, it has also been documented by Dr. Bill Cleary (CPE, 2009, Appendix B), that changes in the behavior of the shorelines on the northeast end of North Topsail Beach and the southwest end of Onslow Beach correspond to the orientation and migration of the main channel through the ebb tide delta of New River Inlet. The realignment of the ebb channel to the northeast or toward Onslow Beach, as occurred between 1998 and 2003 is accompanied by a shift in the apex of the ebb-tidal delta to the northeast or toward Onslow Beach. These changes in the configuration of the ebb-tidal delta modify sediment transport patterns on North Topsail Beach and exposed the northernmost end of the beach to direct wave attack resulting in elevated erosion rates.

## EQUIPMENT AND METHODS

Due to the scope and precision required by modern sand search protocols, a wide range of geophysical and geotechnical survey methodologies are required. The Phase II investigations included jet probe surveys, bathymetric, sidescan sonar, seismic reflection profiling and magnetometer surveys, characterization of the existing beach as well as determination of sediment composition and thickness via vibracoring. The collection and processing of this data is described below. The collection and processing of the geotechnical data (jet probe, vibracores, and native beach characterization) is also described below. The geophysical and geotechnical equipment used during the Phase II investigation is listed in Table 1 and described below.

Table 1. *Equipment used during the sand search investigation.*

Equipment Type	Description
Navigation	Trimble Differential Global Positioning System (DGPS) interfaced with Hypack Inc.'s Hypack Max ® software
Sounder (Bathymetry)	Innerspace Technology, Inc.'s "Innerspace 448" Single Frequency Depth Sounder
Sub-bottom Profiler (seismic reflection)	Edge Tech X-STAR SB-512i Sub-bottom Profiler
Sidescan Sonar	EdgeTech 4200-FS
Vibracores	271B Alpine Pneumatic Vibracore and Athena Cabled Mechanical Vibracore and Generator System
Magnetometer	Geometrics G-882 Digital Cesium Marine Magnetometer interfaced with Hypack Max ® software

### Navigation System

The navigation and positioning system used in the sand search was a Trimble Differential Global Positioning System (DGPS) that was interfaced to Hypack Inc.'s HYPACK MAX®. A Pro Beacon receiver provided differential GPS correction from the U.S. Coast Guard Navigational Beacon located at New Bern, North Carolina. The DGPS initially receives the civilian signal from global positioning system (GPS) NAVSTAR satellites. The locator automatically acquires and

simultaneously tracks the NAVSTAR satellites, while receiving precisely measured code phase and Doppler phase shifts, which enables the receiver to compute the position and velocity of the vessel. The receiver then determines the time, latitude, longitude, height, and velocity once per second. The GPS accuracy, with differential correction used in this study, provides for a position accuracy of one (1) to four (4) feet, which is within the accuracy needed for geotechnical investigations for sediment sources. The USACE test of the U.S. Coast Guard beacons found an accuracy of at least five (5) feet approximately 94% of the time.

### **Survey Integration via Hypack Inc.'s HYPACK MAX®**

Navigational, magnetometer, and depth sounder systems were interfaced with an onboard computer, and the data integrated in real time using Hypack Inc.'s HYPACK MAX®, a state-of-the-art navigation and hydrographic surveying system. Online screen graphic displays include pre-plotted survey lines, the updated boat track across the survey area, adjustable left/right indicator, as well as other positioning information such as boat speed, quality of fix, and line bearing. All data are recorded on the computer's hard disk and transferred to a USB memory stick each day during the survey to backup raw survey data. After post-processing, the navigation data (locational) stored in the HYPACK MAX® system was then exported to a \*.dxf file and imported into ArcGIS 8 in order to create a GIS shapefile for analysis and report preparation. Post-processing of the bathymetric data is also done in HYPACK MAX® where tide corrections and sound velocity corrections are applied to the data. A final ASCII text file of X, Y, Z data is exported out of the HYPACK MAX® software for future use in contouring bathymetric surfaces.

### **Bathymetric Survey**

The Innerspace 448 single frequency depth sounder (Innerspace Technology, Inc.) was used to perform the bathymetric survey. The Innerspace 448 operates at a frequency of 208 kHz and is a digital, survey-grade sounder. Prior to use, the sounder was calibrated and checked periodically throughout the survey. The sounder was calibrated by using an Odom Hydrographic Systems, Inc.'s DIGITAL PRO® speed-of-sound velocity meter. Speed of sound through water and other selected parameters are adjusted to accurately reflect physical water conditions in the survey area.

### **Magnetometer Survey**

A Geometrics G-882 Digital Cesium Marine Magnetometer was used to perform a cursory investigation of magnetic anomalies within the potential borrow areas. The purpose of the magnetometer survey was to establish the presence of any underwater wrecks, submerged hazards, or other features that would require exclusion zones that could affect borrow area delineation and dredging activities. The HYPACK MAX® software recorded magnetic anomalies directly from the Geometrics magnetometer.

### **Sidescan Sonar Survey**

An EdgeTech 4200 FS sidescan sonar system was used to characterize the unconsolidated sediment surface and to map the location of ocean bottom features such as underwater wrecks,

submerged hazards, hardbottom resources and other features that could affect borrow area delineation and dredging activities. The 4200 FS uses full-spectrum chirp technology to deliver wide-band, high-energy pulses coupled with high resolution and superb signal to noise ratio echo data. The sonar package included the portable configuration with laptop computer running Discover® acquisition software and a 120/410 kHz dual frequency towfish running in high definition mode.

The sidescan was towed at an optimum position and depth (approximately 7-12 ft. below the sea surface) to ensure isolation from sources of interference and for optimum record quality. The digital sidescan data was merged with positioning data (DGPS via HYPACK MAX®), video displayed, and recorded to the acquisition computer's hard disk for post processing and/or replay. At the end of the survey day, all data was transferred to a portable hard drive to back-up raw survey data. The position of the sensor relative to the DGPS antenna was documented to ensure proper positioning of the data. Range scales were set at 150 m (492 feet), providing over 100% coverage. Dual frequency provided a differential aid to interpretation.

Isis Sonar software was used to process sidescan sonar data in a geographical framework for target interpretation and delineation. The geo-encoded sidescan sonar imagery data were stored as \*.xtf files. The \*.xtf files were converted to *DDS\_VIF* raster imagery files using the Isis sonar software. The raster imagery files were then imported into the Triton Erics DelphMap® software to be further processed, merged, and exported in the form of geo-referenced sidescan mosaics (*geo-tiff* files). Morphological features and potential artifacts observed in the sonar displays and records were digitized in DelphMap®, edited in AutoCAD, and saved as \*.dwg files.

### **Sub-bottom Profile Survey**

CPE used EdgeTech SB512i seismic instrumentation to acquire shallow sub-bottom data in prior sand searches in Florida (east, west, and panhandle coasts) and coastal Louisiana. The EdgeTech 512i system often shows a distinct reflector at the boundary between sand deposits and coarser-grained rubble deposits, finer-grained accumulations (silts and clays), or rock.

The X-STAR Full Spectrum Sonar is a versatile wideband FM sub-bottom profiler that collects digital normal incidence reflection data over many frequency ranges. This instrumentation generates cross-sectional images of the seabed (to an approximate depth of 30 feet in this survey). X-STAR transmits an FM pulse that is linearly swept over a full spectrum frequency range (also called a “chirp pulse”). The tapered waveform spectrum results in images that have virtually constant resolution with depth.

The SB-512i, the latest model of the EdgeTech suite of Chirp Full-Spectrum sub-bottom towfish, has one 13” diameter low-frequency transducer and one 6.5” diameter high-frequency transducer. This low-frequency transducer provides more low-frequency energy at all pulse settings, which allows deeper penetration of seafloor sediments while at the same time maintaining the high resolution of the original configuration.

The Chirp systems have an advantage over 3.5 kHz and boomer systems in sediment delineation because the reflectors are more discrete and less susceptible to ringing from both vessel and

ambient noise. The full wave rectified reflection horizons are cleaner and more distinct than the half wave rectified reflections produced by the older analog systems.

Because the model SB-512i tow vehicle weighs over 400 pounds, deployment must be accompanied by a sufficiently large vessel equipped with a davit or crane (Figure 3). It has been our experience, however, that SB-512i transducers achieve deeper penetration through sands than do smaller (and lighter) higher frequency towfish that are easier to deploy. The SB-512i frequency range thus generates a very high-resolution image of the sub-bottom stratigraphy in sand to a depth of 20-50 feet below the sediment-water column interface, which are the typical depths of interest for sand searches.



Figure 3. CPE geologists and Sonographic technician deploying the SB-512i towfish used for sub-bottom profiling.

All sub-bottom data were recorded on the acquisition computer's hard disk and transferred to a USB memory stick and/or portable hard drive at the end of each survey day to back-up raw survey data.

The raw subbottom data is collected in an EdgeTech .JSF format and then later re-written to a \*.SGY format for integration with the Chesapeake Technologies Sonarweb® software used to image the subbottom data. Recording the data in the \*.JSF format preserves a higher quality data file for future development. Once the data has been brought into the Sonarweb® software, seismic reflectors can be digitized onto the images and exported out in both an ASCII file with X, Y, and Z values for contouring and a georeferenced HTML that can be viewed using any web browser software (Internet Explorer, Netscape, etc.).

## **Jet Probe Survey**

Jet probing, as described by FINKL and BENEDET (2003), involves geologists who are proficient in SCUBA diving, to operate the jet probe by penetrating a graduated 7 m water pressure pipe into the ocean bottom and making observations as it passes through the sediment layers. The geologist is on the bottom and the support diver stays at the upper end of the probe to hold it upright against the current (Figure 4). The support diver also observes the turbidity level changes from above as silt is washed out of the probe hole (becoming suspended in the water column) during penetration of the seafloor. The geologist on the bottom observes the graduated scale on the probe and by the “feel” of the objects it encounters, makes mental notes of the depths of each change in texture, which are afterwards incorporated into the field log (cf. Figure 2). An experienced diver-geologist can distinguish layers such as shell, rubble, sand, peat, clay and rock. The probe is jetted to the total length of the pipe (usually 7 m) or until it encounters a layer that it is unable to penetrate.

## **Vibracore Survey**

Two different methods of obtaining vibracore samples were employed during this sand search investigation. A 271B Alpine Pneumatic Vibracore, configured to collect undisturbed sediment cores 20 feet in length, was used for the offshore portion of the project (Figure 4). This self-contained, freestanding pneumatic vibracore unit contains an air-driven vibratory hammer assembly, an aluminum H-beam which acts as the vertical beam upright on the seafloor, a steel coring pipe (with a plastic core liner), and a drilling bit with a cutting edge. An air hose array provided compressed air from the compressor on deck to drive the vibracore. If penetration refusal occurred at less than 80% of expected penetration, the sampled portion was removed from the pipe, a new liner inserted, and a jet pump hose was attached just below the vibracore head. After lowering the rig to the bottom and jetting to one (1) or two (2) feet above the refusal depth, the jet was turned off and the vibrator turned on in order to collect the remaining core. The vibracore unit was crane deployed from a work barge (Figure 4) which in turn was towed to the deployment site by the towing vessel *Miss Jean*.

After core retrieval, the barrel was split in half (lengthwise), logged, and sampled on board the work barge (Figure 4). Splitting the vibracores during field investigations provides an opportunity for immediate inspection of the core and assessment of environmental conditions and real-time optimization of the vibracoring plan (the sampling program can be modified on the basis of what is observed in the recovered materials). This flexibility in the field helps to reduce costs associated with deployment and setup of vibracore investigations. Other advantages from core splitting and logging in the field are realized when it can be immediately determined whether shorter than expected cores are due to loss of sediment or compaction, or whether there are other abnormalities such as coarse materials plugging the core causing gaps in sediment retrieval, *etc.* Upon completion of field operations, the vibracores were retuned to the CPE laboratory in Boca Raton, Florida, where they were re-examined and photographed.

For the New River Inlet portion of the sand search investigation, vibracores were collected by Athena Technologies of Columbia, South Carolina, under the direction of a CPE-NC geologist,

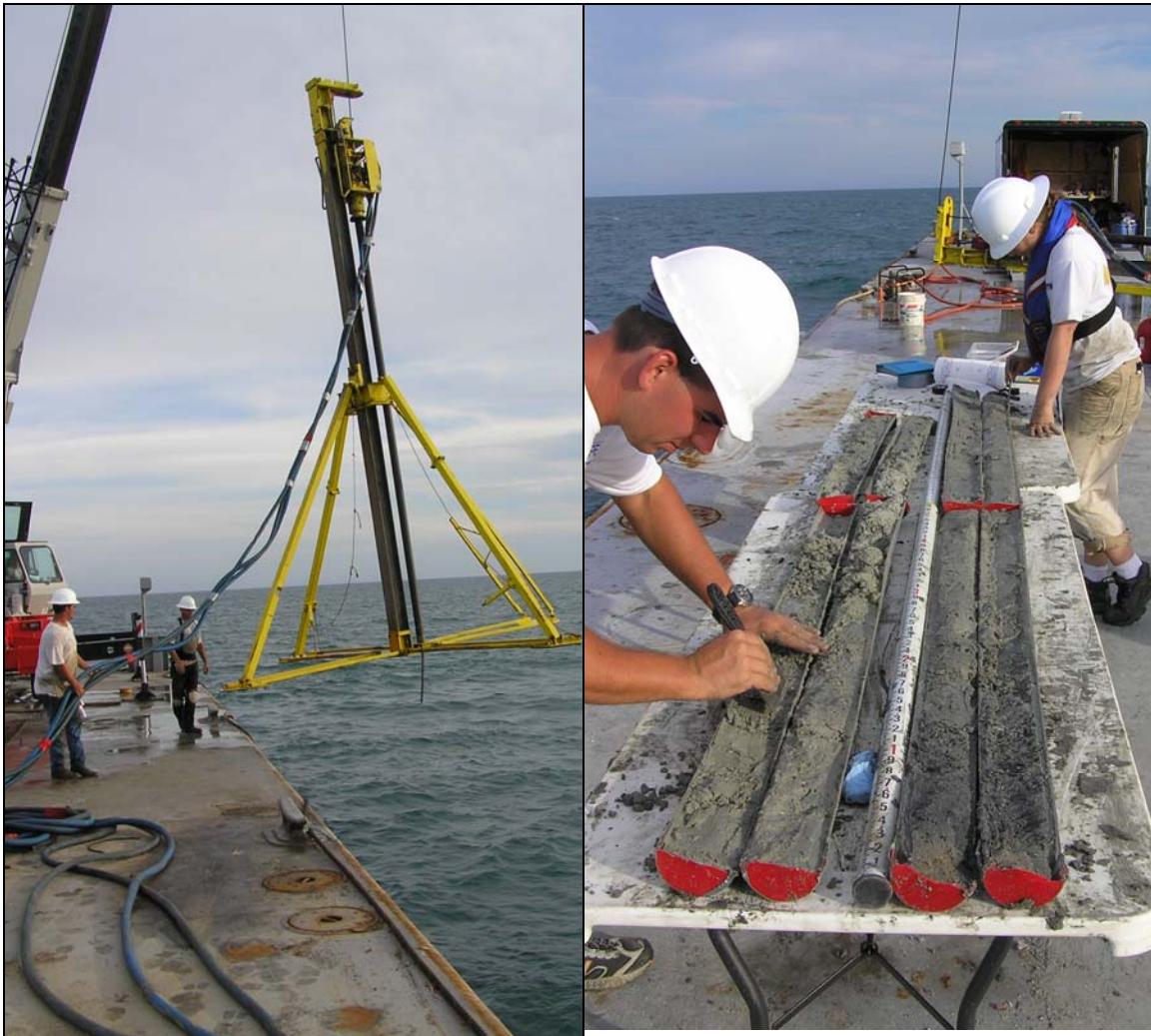


Figure 4. Deployment of the vibracore unit (left photograph) and core logging (right photograph), including macroscopic descriptions of sediment properties, by CPE geologists on the barge. Core logging is conducted simultaneously with vibracore operations.

using a system consisting of a generator and mechanical vibracore head connected via cable to a 3-inch galvanized steel tube (Figure 5). The tube was vibrated to a pre-determined depth below the sediment-water interface or until refusal was experienced. Several vibracores, required a two to three phase approach to retrieve sufficient material. In the first phase, a 3-inch galvanized steel tube was vibrated into the sediment to the depth of refusal. This was followed by jetting (with water pressure) a 3-inch galvanized steel tube to the depth of 2 feet above recovery and then vibrating the 3-inch galvanized steel tube into the sediment to the pre-determined depth for that particular vibracore or until the vibracore encountered refusal. If this second attempt did not recover a core of sufficient length, a third attempt was made to recover material to a sufficient depth.

After core retrieval, the barrel was split in half (lengthwise) to enable logging. All vibracores were logged in detail by describing sedimentary properties by layer in terms of layer thickness,

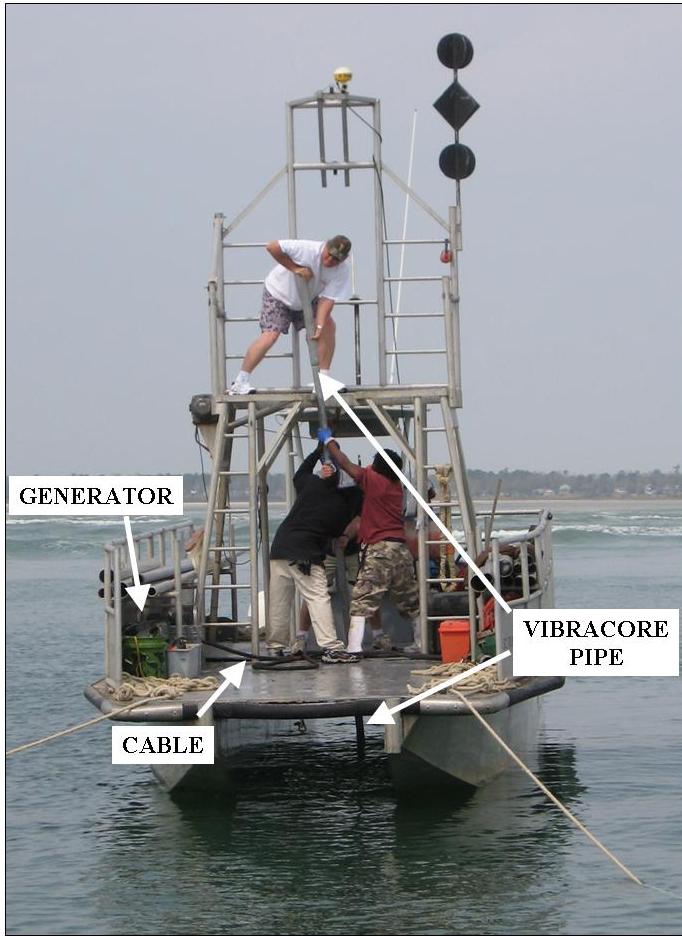


Figure 5. The Athena Technologies vibracore system showing the components of the Cabled Mechanical Vibracore and Generator system.

color, texture (grain size), composition and presence of clay, silt, gravel, or shell and any other identifying features. Select vibracores were digitally photographed against an 18% gray background in 2 ft. intervals. Sediment samples were obtained from irregular intervals based on distinct layers in the sediment sequence. Sediment samples extracted from the vibracores, underwent grain-size analysis.

### **Compatibility Analysis**

In February 2007, the North Carolina Coastal Resource Commission (CRC) adopted a comprehensive list of technical standards for beach fill projects (15A NCAC 07H.0312). Among these standards were specific tasks to determine the compatibility of native vs. beach fill sediments. These standards include sediment characteristics such as percent Silt, percent sand, percent granular, percent gravel, percent carbonate, and the amount of sediments and shell material greater than three (3) inches in diameter.

The USACE conducted native beach samples along twelve (12) profiles spaced 5,000 feet apart for the length of North Topsail Beach for the Federal Feasibility study for storm damage

reduction for Surf City and North Topsail Beach prior to the adoption of the State Standards. The USACE collected four (4) samples landward of Mean Low Water (MLW) at the Toe of the Dune, the Berm (+7 feet elevation), Mean High Water (MHW), and Mean Tide Level. The State Technical Standards require that six (6) samples be collected landward of MLW. The State Technical Standards also require that percent carbonate values are determined by weight percent. The carbonate analysis done by the USACE was the result of visual estimates on percent shell during the sieving procedure and thus was not in compliance with the Standards.

CPE collected thirteen (13) samples along each of the twelve (12) profiles that the USACE had sampled. Sample locations were determined using a Real Time Kinematic (RTK) Global Positioning System (GPS).

CPE conducted sieve analysis on samples taken from the dune and one other sample collected between the Berm sample and the MHL sample of the USACE. All sieve analysis was done in accordance with American Society for Testing and Materials Standard Material Designation (D422-63) for particle-size analysis of soils (ASTM, 1987). The results of the two additional samples per profile were weighted into the USACE results to generate composite grain sizes and percent silt, sand, granular, and gravel sized sediments.

In order to determine percent carbonate for the native samples, CPE generated a mechanical composite of the thirteen (13) samples for each of the twelve (12) profiles. Vibracores used in the development of the borrow areas were sampled from the bottom of the cut to the top of the core using a trenching technique in order to develop a composite sample for each vibracore. These composite samples were each subjected to an acid digestion process to determine percent by weight calcium carbonate.

### **Quantifying Clasts > Three Inches**

CPE conducted a survey of a 50,000 square foot portion of North Topsail Beach in the vicinity of station 1070+00. The area was staked out using RTK GPS to mark the four corners of a rectangular section of the beach measuring 280 feet along the beach from the toe of dune to the MLW Line (distance of 180 feet). Using RTK GPS the area was staked out into 10 ft. x 10 ft. blocks to facilitate the counting of clasts > three inches in each block (Figure 6).

### **Particle-Size (Mechanical) Analysis of Sediments**

Sieve analyses were conducted for samples obtained by vibracoring in accordance with American Society for Testing and Materials Standard Materials Designation (D422-63) for particle-size analysis of soils (ASTM, 1987). This method covers the quantitative determination of the distribution of sand size particles. Mechanical sieving was accomplished using a calibrated sieve stack with a gradation of half phi intervals. Additional sieves representing key ASTM sediment classification boundaries were also used, per Florida Department of Environmental Protection standards.

Grain size results (distribution of particle sizes) were entered into the gINT® software program, which computes the mean and median grain size, sorting, and silt/clay percentages for each



Figure 6. Layout of survey area to quantify the amount of clasts > three inches in diameter within a 50,000 ft.<sup>2</sup> area of North Topsail Beach. Note: wooden stakes around the perimeter of the survey area and utility flags marking the corners of 10' x 10' blocks.

sample using the moment method (FOLK, 1974). A grain-size distribution curve for each sample as well as composites for each vibracore and each subsequent borrow area were compiled.

#### **Carbonate Analysis to Determine Percent by Weight Carbonate**

Carbonate analysis of composite existing beach samples and composite vibracore samples were conducted according to Florida Test Method for Carbonates and Organic Matter in Base Material (FM 5-514). This method uses at least 1.0 g of sample placed in a 300 mL beaker along with 20 mL of a 1:5 solution of hydrochloric acid (1 part HCl to 5 parts distilled or deionized water). The beaker is heated to boil and then allowed to stand until the last of the gas has evolved from the sample. Three (3) drops of phenolphthalein solution are added to the beaker. The contents of the beaker are titrated to pink with a 1:5 ammonium hydroxide solution (1 part NH<sub>4</sub>OH to 5 parts distilled or deionized water) and boiled momentarily. The contents of the beaker are then filtered and washed with water. At this point in the process the remaining material is weighed which is the insoluble residue (R). The percent by weight of carbonate is calculated using the following equation:

$$C = \frac{(W - R)}{W} \times 100$$

where: C = Percent by weight carbonates

W = Mass of sample

R = Insoluble residue

## INVESTIGATION SEQUENCING

A methodological approach to marine sand searches, developed by the CPE Coastal Geology and Geomatics team (FINKL, KHALIL and ANDREWS, 1997; FINKL, ANDREWS and BENEDET, 2003; FINKL, BENEDET and ANDREWS., 2005; FINKL and KHALIL, 2005), was applied to this sand search investigation. In comprehensive marine sand searches, CPE typically employs sequential survey procedures that maximize resources to effectively characterize offshore sand deposits. These sequential surveys collect preliminary data over relatively large expanses of seafloor in the form of surface grab samples, jet probes, and reconnaissance bathymetry prior to the collection of remotely sensed data (*i.e.* seismic reflection profiles, sidescan sonar characterization of the seafloor and magnetometer surveys) and vibracores in smaller target areas. Reconnaissance-level surveys that cover large areas of the seafloor provide useful information that helps define smaller targets (areas with higher potential for containing materials that are suitable for beach nourishment) where more intensive (and more expensive) sand and cultural resource investigations are conducted. The investigative sequence, shown in Figure 7, describes the logical progressions and interactions between different data sources and indicates the steps that were followed by CPE-NC geologists and geophysicists during the North Topsail Beach and New River sand searches.

## RESULTS AND DISCUSSION

A methodological approach to marine sand searches, developed over the years by the CPE Coastal Geology and Geomatics team (*e.g.* FINKL, KHALIL and ANDREWS, 1997; FINKL, ANDREWS and BENEDET, 2003; FINKL *et al.*, 2004; FINKL and KHALIL, 2004), was adapted to the North Topsail Beach offshore conditions and applied throughout this sand search investigation. In comprehensive marine sand searches, CPE typically employs sequential survey procedures that maximize resources to effectively characterize offshore sand deposits. These sequential surveys collect preliminary data over relatively large expanses of seafloor in the form of surface grab samples, jet probes, and reconnaissance bathymetry prior to the collection of remotely sensed data (*i.e.* seismic reflection profiles, sidescan characterization of the seafloor and magnetometer surveys) and vibracores in smaller target areas. Reconnaissance-level surveys that cover large areas of the seafloor provide useful information that helps define smaller targets (areas with higher potential for containing materials that are suitable for beach nourishment) where more intensive (and more expensive) sand and cultural resource investigations are conducted.

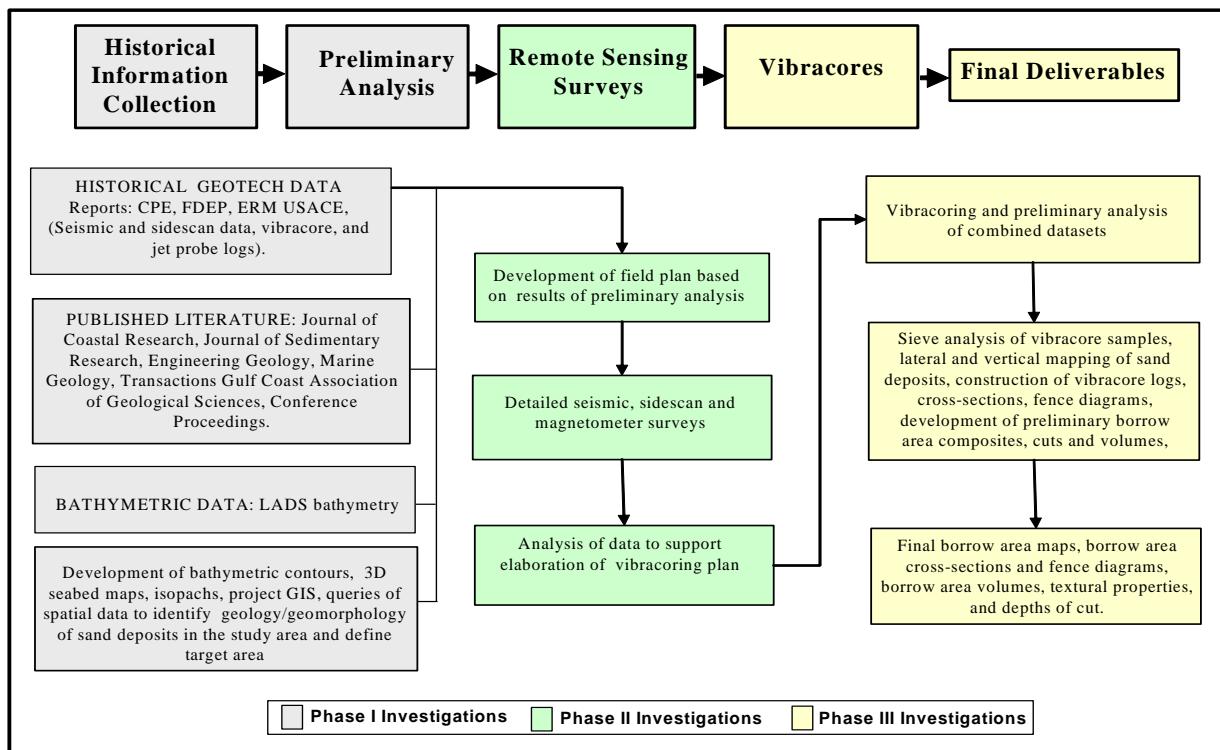


Figure 7. Flow diagram showing the main phases of sand search investigations for the Town of North Topsail Beach sand search.

The investigative sequence for North Topsail Beach was modified to incorporate the large amount of offshore data available for the historical data analysis phase. During Phase I (review of historical data), CPE researched literature in public and private archives and incorporated the extensive geotechnical (vibracores) and geophysical data (sidescan and seismic) into a GIS geodatabase for the project area. This analysis identified locations where data was missing. A reconnaissance jet-probe analysis and bathymetric investigation was thus planned to fill in data gaps between existing vibracores and verify elevation and sediment thickness between historical vibracores. Based on the combined data from vibracores and newly collected jet probes, regional and detailed high-resolution seismic investigations were planned along the areas that showed the largest potential for sand resources. Correlation of seismic reflectors with existing geotechnical data supported continuous mapping of sand deposits along the areas surveyed. This mapping defined a smaller target area where detailed vibracores could be collected to support a design-level borrow area.

Review of historical information focused on vibracore data (provided by a 2003 USACE study) and regional sidescan imagery obtained by graduate students from the University of North Carolina at Wilmington (JOHNSTON, 1998; and WILLSON, 2009). This information provided details regarding occurrences of potential hardbottoms (based on interpretation of sidescan imagery), evaluation of sediment quality, and determination of deposit thickness (as measured in vibracores). Locations of USACE vibracores and seismic tracklines are shown in Figure 8.

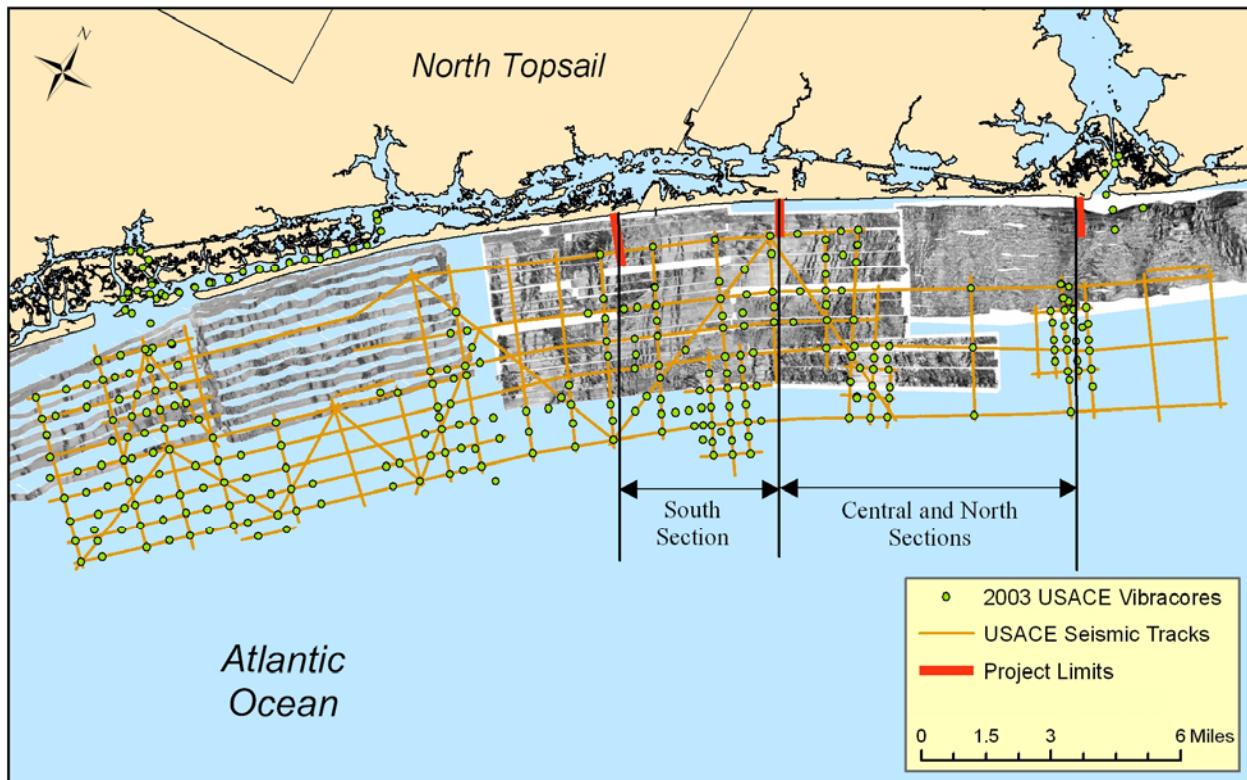


Figure 8. Location of USACE vibracores and seismic tracklines overlaid on sidescan imagery from the University of North Carolina at Wilmington. The nourishment project section limits (South Section, Central and North Sections) are delimited by the red lines lying perpendicular to the shore.

In an effort to fill in data gaps between vibracores, jet probes (Figure 9) were used to determine sediment thickness. The jet probes were obtained in three main areas: (1) four probes offshore of New River Inlet (probes 7 to 10, Figure 6), (2) eight jet probes in the nearshore zone offshore of Topsail Beach (probes 3 to 6 and 11 to 15, Figure 9), and (3) two jet probes seaward of this nearshore area (probes 1 and 2, Figure 9). Jet probe data, which corroborated interpretations of historical vibracores, indicated that the nearshore area near the beach (southwest section of the study area) and the area offshore from New River Inlet are potential sand sources for North Topsail Beach.

Analysis of this combined dataset comprised of jet probes, vibracores and historical sidescan imagery and seismic images defined two target areas for high-resolution offshore geophysical investigations (Figure 10). High-resolution seismic, bathymetric and sidescan surveys were conducted in these target areas in an effort to map surface topography (bathymetry of the seafloor) and rock outcrops. Geophysical tracklines were positioned to cross over historical vibracore locations (Figure 10). The geophysical investigations consisted of four days of offshore work with preliminary data analysis conducted in the field with a GIS updated on-the-fly as the survey progressed. During the first two days of offshore operations, data were collected in the two target areas with an approximate trackline spacing of 600 ft. Analysis of data in the field permitted selection of a smaller survey area (300 ft. trackline spacing) for completion during the third and fourth days. The seismic reflection profile data were used to map continuity

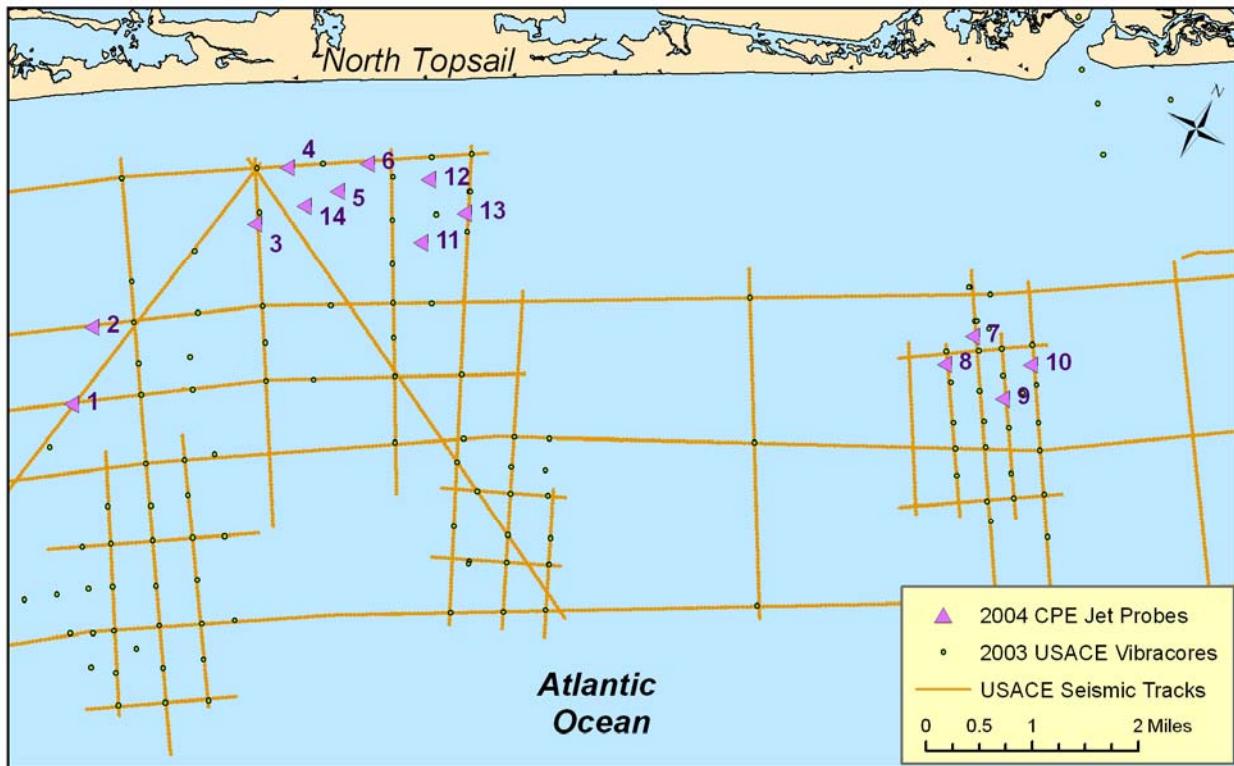


Figure 9. Location of jet probes acquired by CPE in 2005 in an effort to fill gaps from historical vibracores, tracklines and sidescan imagery.

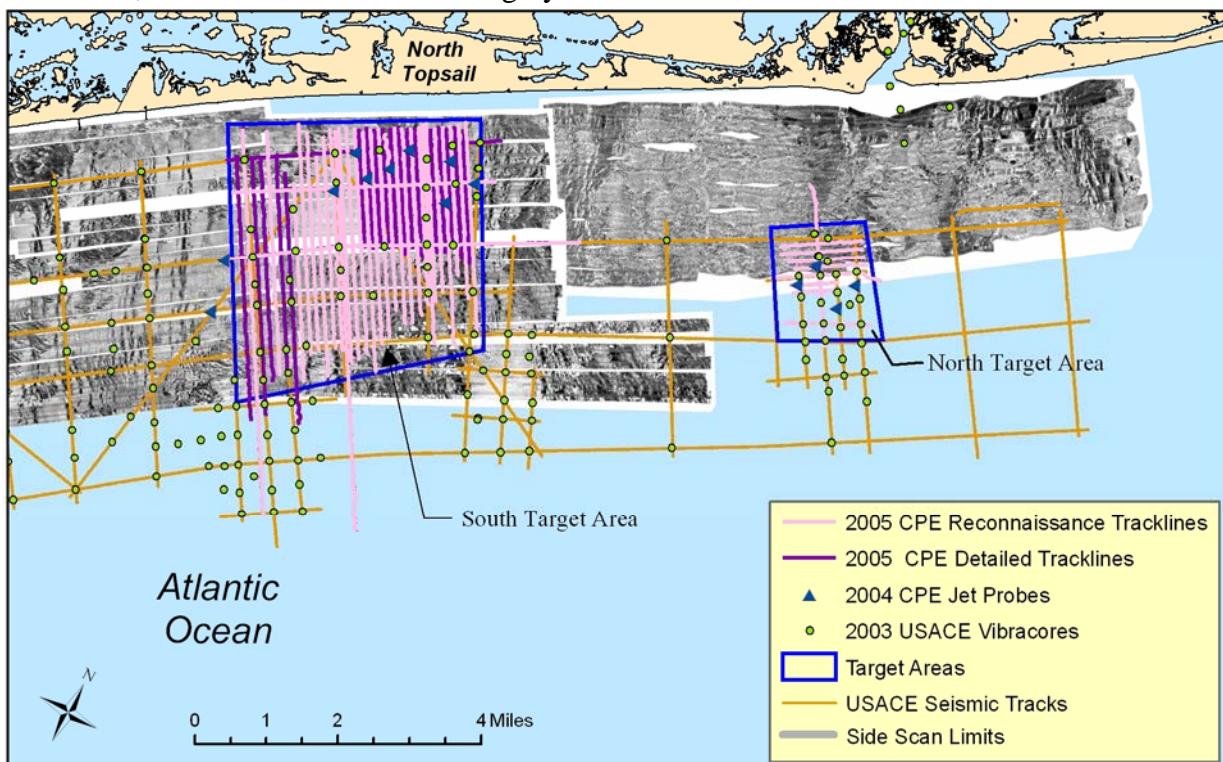


Figure 10. Seismic tracklines surveyed by CPE in 2005 are shown in relation to USACE vibracores, seismic tracklines, and CPE 2005 jet probes.

of sand deposits. Correlations between seismic reflectors and vibracores and jet probes were made in the field where seismic tracklines passed over or occurred in close proximity to historical vibracore and jet probe sites. These historic data were used to interpret stratigraphic units mapped throughout the sub-bottom survey. Study of the high-resolution seismic data indicated that two areas of high sand resource potential were concentrated offshore of New River Inlet and in the NE corner of the nearshore study area off of North Topsail Beach where detailed seismic data was collected (Figure 10). A 30 ft. thick sand deposit infills a relict channel cut into the seafloor in the nearshore area (Figure 11).

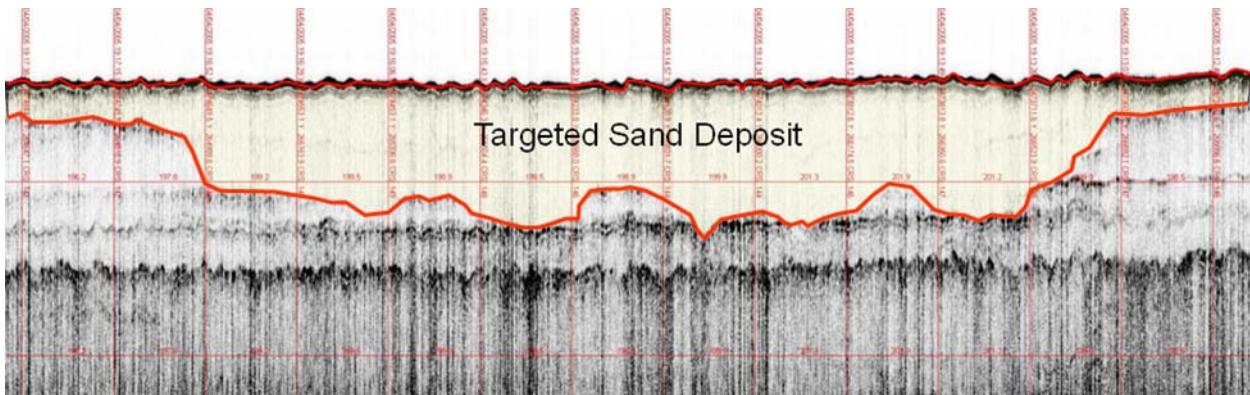


Figure 11. Seismic cross-section of channel deposits in the nearshore study area offshore from North Topsail Beach. Note red line at base of “Targeted Sand Deposit” represents the base of the sand deposit and/or the top of bedrock.

Sidescan data acquired during these geophysical investigations were assimilated in the form of a mosaic. Nearshore hardbottom habitats (rock outcrops) were delineated by merging newly acquired sidescan data with historical imagery and diver observations. Hardbottom (rock outcrops) occurs on shoreward and seaward margins of the nearshore survey area off of North Topsail Beach as well as throughout the area offshore of New River Inlet (Figure 12). Detailed descriptions of these hardbottom areas, including with field documentation and diver observations, can be accessed in Appendix E – Essential Fish Habitat Assessment.

The locations of 1000-ft. spaced vibracores, required by the State of North Carolina for borrow area design, targeted areas based on interpreted sediment thickness (from seismic and historical geotechnical data). Likewise, cores placement sought to avoid areas where hardbottom was likely to occur based on sidescan sonar interpretations. Figure 12 shows the locations of vibracores collected in 2005 in relation to historical vibracores, CPE jet probes, and interpreted hardbottom. Thirty (30) vibracores were taken in the summer of 2005. An initial determination of the volume of sand contained in the offshore borrow area was made following the collection and analysis of the 2005 vibracores. Subsequently the Town of North Topsail Beach deciding to add the southern section of the Town to the shoreline protection project in early 2006. This modification by the Town required a second set of vibracores (18) to be taken in the summer of 2006 in order to delineate a larger borrow area to account for the added material necessary to construct the project along the entire length of the town.

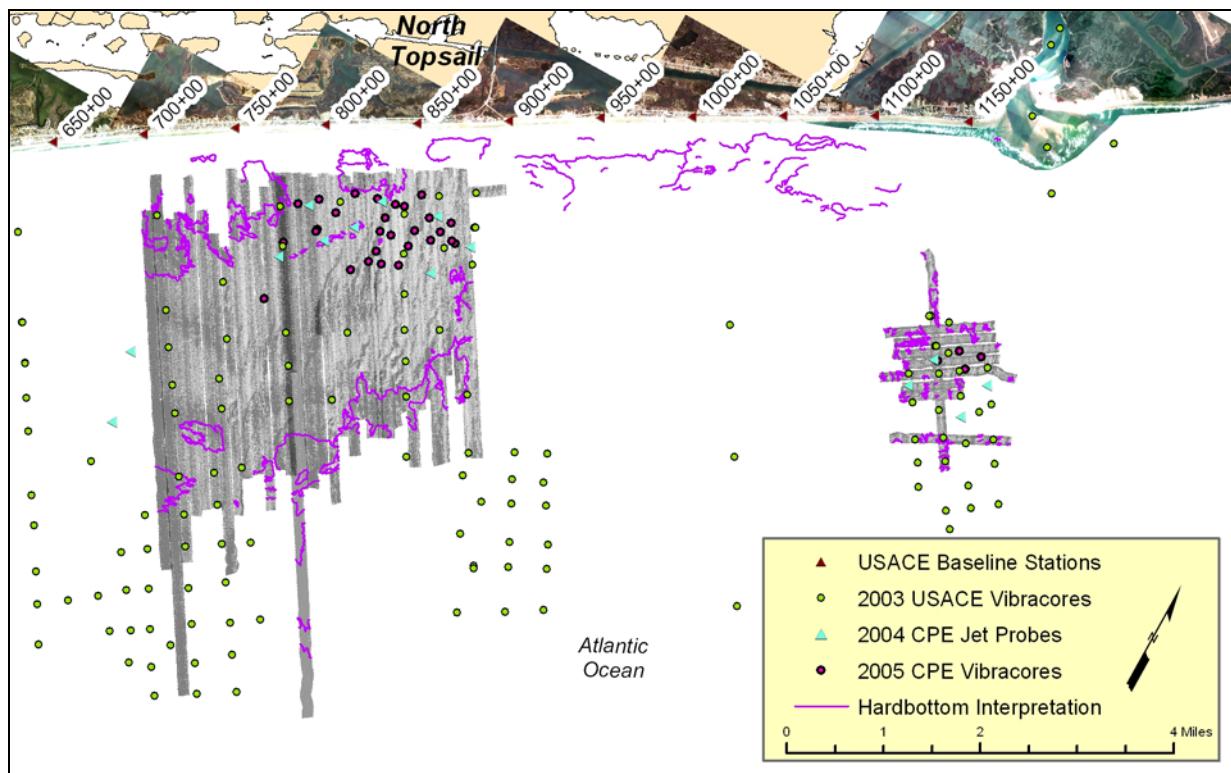


Figure 12. Locations of USACE 2003 vibracores, CPE 2005 jet probes, and rock outcrops on the seafloor (interpreted as hardbottom habitats) that were used to determine the locations of additional vibracores for detailed study of sedimentary properties.

The four vibracores obtained offshore of New River Inlet in the 2005 vibracore survey, recovered 12.5 to 20 ft. of sandy sediments with varying percentages of fine-grained (silt plus clay) and coarse-grained (gravel) material. Sediments in these cores contained layers of sandy sediments that were intercalated with silt and clay lenses, silty sands, and clay. Small amounts of gravel were present in some layers. This area was not selected for extensive vibracoring, due to extreme variability of material, as recorded in vibracores, widespread occurrence of sediments that are unsuitable for beach nourishment, and presence of rock outcrops, which limited the lateral extent of sedimentary deposits (Figure 12).

Twenty-six (26) vibracores (NTVC-05-01 through NTVC-05-26) were obtained during the initial 2005 vibracore survey in the southwestern part of the study area near the center of North Topsail Beach (Figure 12). Most vibracores contained at least 10 ft. of beach-quality sand but some cores contained up to 20 ft. of beach quality sand (*i.e.* vibracore NTVC-05-07). In contrast to the northeastern study area, these vibracores contained sediments that were more homogeneous because they lacked thick layers of clay or silt. Gravelly sands were present, however, in a few thin layers. Because the southwestern study area contained beach-compatible sediments with greater lateral and vertical continuity, the area was selected for borrow area development. Subsequently, when the Town made the decision to extend the project limits south to the Surf City, North Topsail Beach border, additional vibracores were taken in the same vicinity in order to expand the existing borrow area.

## Borrow Area Design and Sedimentary Characteristics

Analysis of high-resolution seismic records was used as a basis for mapping the lateral continuity of buried bedrock and/or the base of the targeted sand deposits. A color ramped 3D surface of the reflector representing the top of bedrock and/or the base of the targeted sand deposit was generated in Golden Software, Inc's Surfer 8<sup>®</sup>. This graphic is shown in Figure 13 overlaid by a color ramped 3D surface of the bathymetry of the survey area. The black lines on top of the bathymetric image (Figure 13) correspond to the borrow area planform. Parameters that define the borrow area planform are related to the configuration of the bedrock surface and physical characteristics of the sediment deposit (i.e. grain size, percent silt, percent gravel, etc). The topographic depression, shown in the bottom surface of Figure 10, is interpreted as a relict channel or depression that was cut into the continental shelf during a lower sea-level stand (compared to MSL today). Vibracore investigations have confirmed that the feature is filled with sandy sediments. These sediments in the depression are beach-compatible and thus comprise the borrow area. The bathymetric image in Figure 13 also shows shore-perpendicular to shore-transverse shore-attached bars.

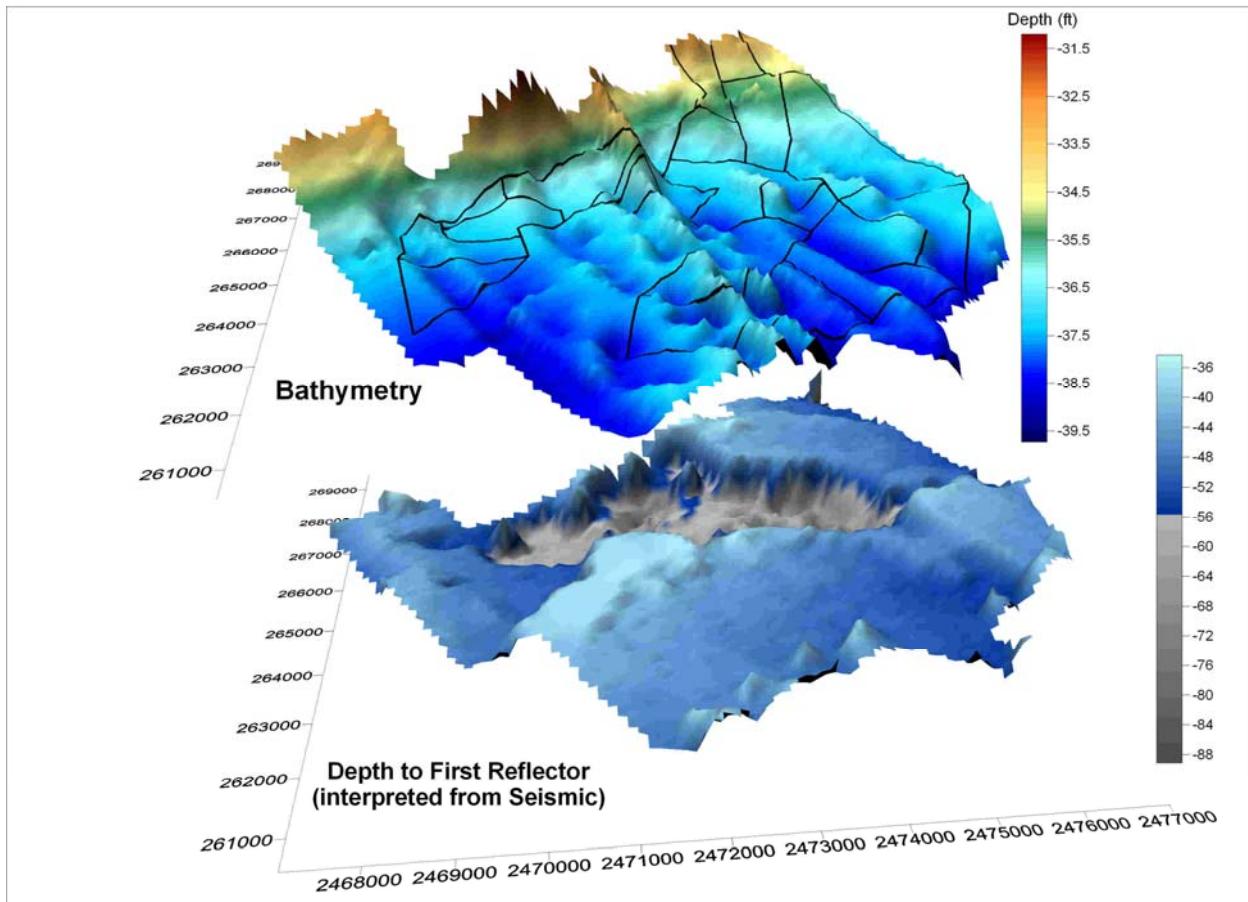


Figure 13. Exploded three-dimensional diagram showing bathymetry (upper image) and the bedrock surface (sub-bottom profile, first reflector in merged seismic reflection profiles) in the southwestern study area. The bedrock surface was mapped from seismic reflectors and vibracore data.

Sediment thickness was calculated by taking the difference between the bathymetric values in the top surface of Figure 13 (seafloor bathymetry) and the topographic values in the bottom surface of Figure 13 (base of sand deposit). Isopachs (lines of equal sediment thickness) were calculated to assist borrow area design (Figure 14). Red and orange tones reflect thinning sedimentary cover in the vicinity of rock outcrops (Figure 14). Geological cross-sections were constructed using data obtained from vibracores obtained by CPE in 2005. These efforts provided understanding of the extent of the depression and sediment characteristics, which allowed for the definition of the initial borrow area for the north and central section of the North Topsail Beach Nourishment Project, and assisted in the planning of the 2006 vibracore efforts to expand the borrow area.

In the summer of 2006, eighteen additional vibracores were obtained around the perimeter of the existing borrow area in order to expand the area and volume of the permissible borrow area (Figure 14). These data were analyzed in a similar methodology as described above for the 2005 vibracores and borrow area composites and volumes were updated. Upon compilation of all vibracore and sub-bottom profile data for the area it has been determined that sediment thickness in the area ranges up to 44 ft. in the center of the depression, and thins out to no sediment cover in adjacent areas where rock exposed hardbottom exists. The final borrow area, as shown in Figure 14, is bifurcated in an E-W direction by thinner sedimentary layers, compared to flanking deposits, and a small rock outcrop (hardbottom). Sediment thickness within the borrow area has been limited to an eight foot minimum (Figure 14).

### Borrow Area Sediments and Stratigraphy

Sedimentary layers in the borrow area were grouped into four interpretive categories in order to create the schematic geologic cross-sections shown in Figures 15 thru 19 (see Figure 11 for locations of cross-sections). The interpretive classes include: (1) Good Sand, (2) Marginal ‘A’ Sand, (3) Marginal ‘B’ Sand, and (4) Poor Sand. *Good Sand* layers contain light colored sandy sediments with less than 12% silt. *Marginal ‘A’ Sand* contains 12% to 15% silt and some rock fragments. *Marginal ‘B’ Sand* contains gravel and gravelly sands with less than 12% silt. *Poor Sand* is characterized by gravel layers, gravelly sands with more than 12% silt, or sandy sediments with more than 15% silt with some rock fragments.

Cut boundaries in the borrow area are shown by the red lines in the cross-sections (Figures 15 to 19). The designated cuts were designed to include mostly sandy sediments with less than 12% silt (‘*Good Sand*’). A few borrow area corners or bottom of cuts include Marginal ‘A’ and ‘B’ Sands. Cross-section A-A’ (Figure 15), oriented alongshore (shore parallel direction), contains mostly good sand. Thin layers of gravelly sands occur on the northeastern flank while finer sediments occur on the southwestern margin. Thick layers of clean sand occurring in the center of the cross-section fill the depression that cuts into the underlying unit interpreted to be Oligocene in age (WILLSON, 2009). The alongshore transect B-B’ contains mostly good sand. Cross-section C-C’, oriented in a cross-shore direction, shows that the sand layer in vibracore NTVC-05-13 becomes thinner requiring adjustment of the cut.

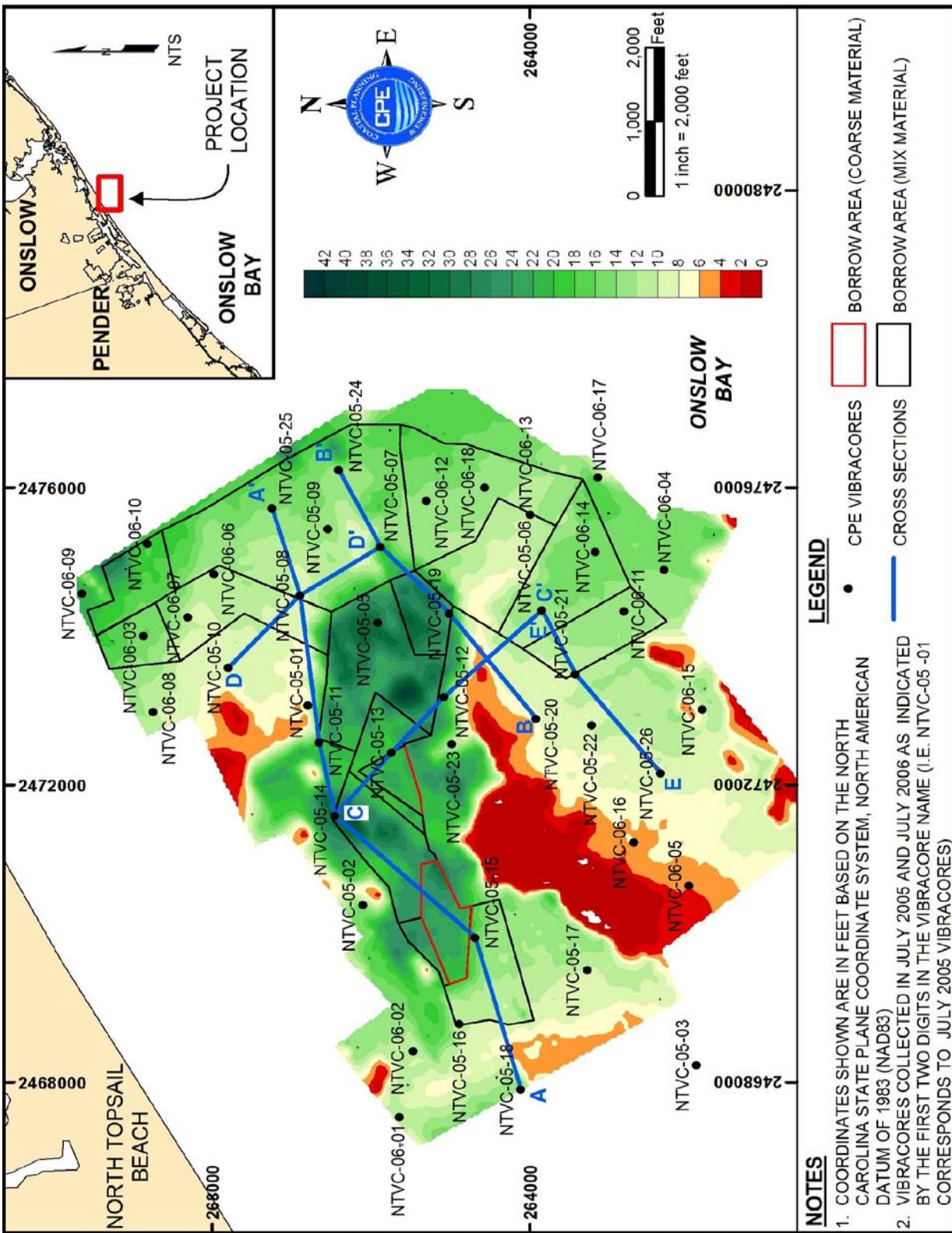


Figure 14. Map depicting cross-sections and vibracore locations superimposed upon color ramped surface representing sediment thickness. Note borrow area boundary and individual cut boundaries (orange polygons).

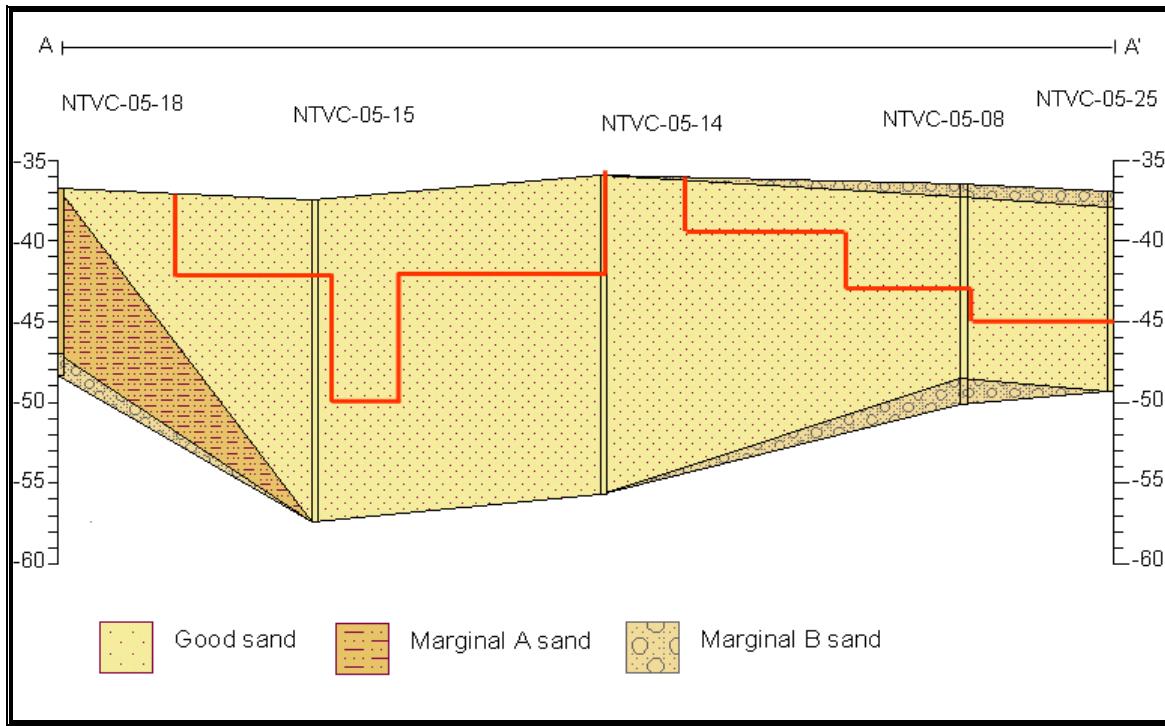


Figure 15. Cross-section A-A' showing preliminary borrow area cuts and sediments (See Figure 11 for location). Cross-section is based on interpolation of 2005 vibracore data.

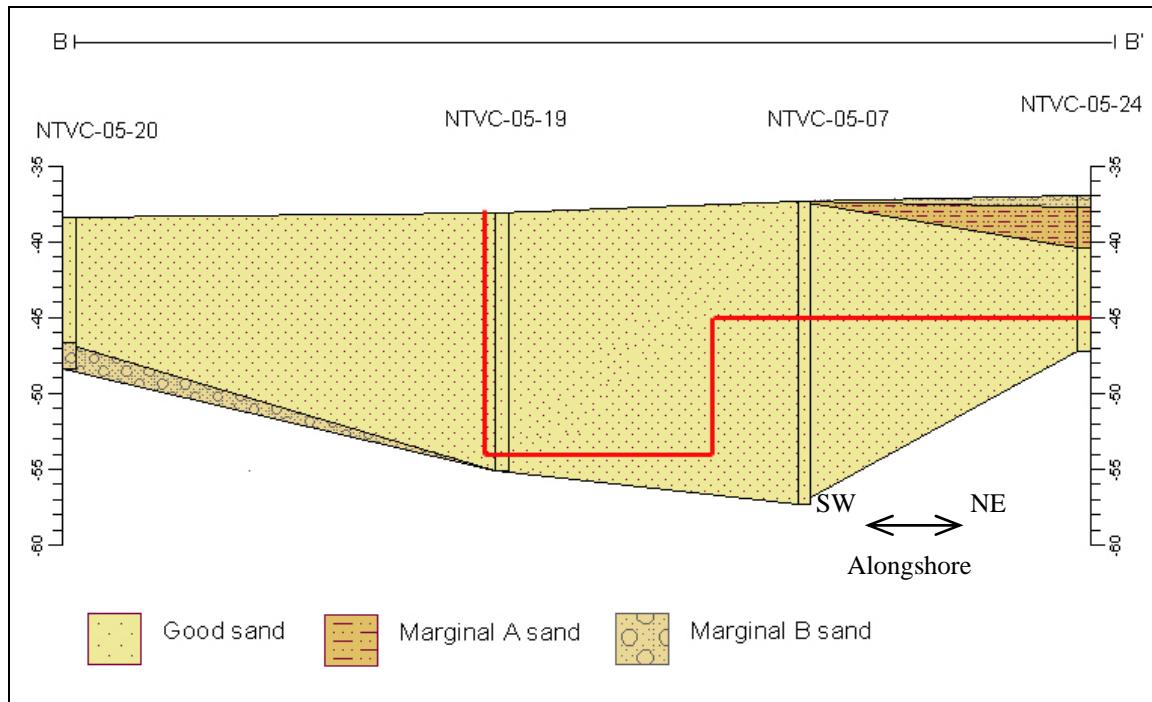


Figure 16. Cross-section B-B' showing preliminary borrow area cuts and sediments (See Figure 11 for location). Cross-section is based on interpolation of 2005 vibracore data.

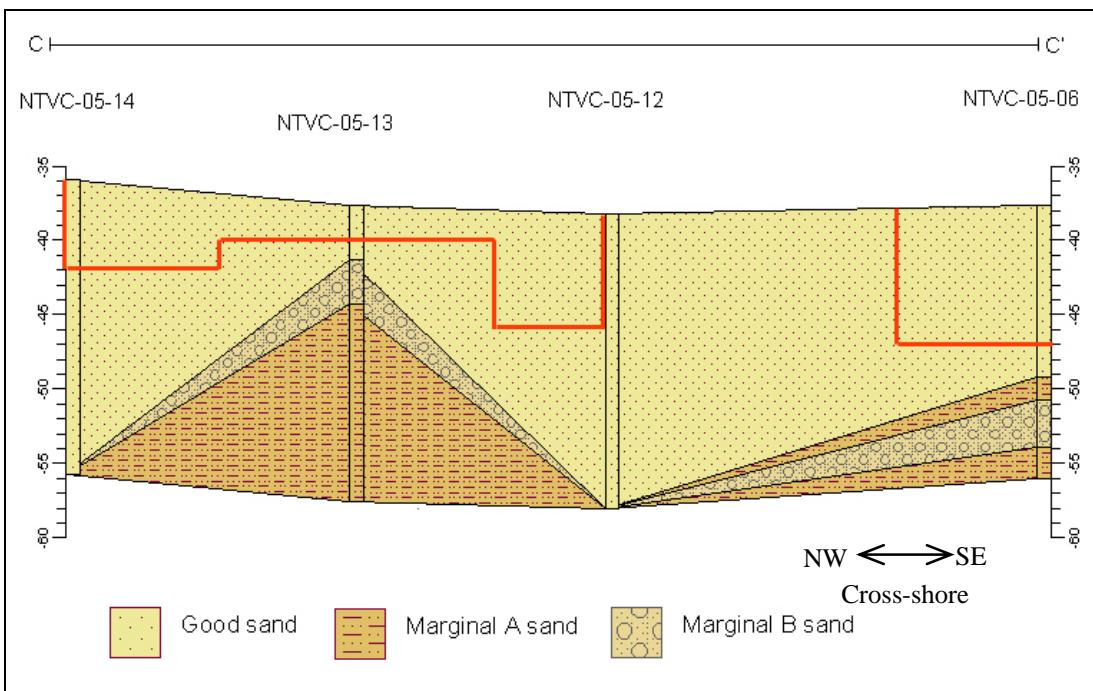


Figure 17. Cross-section C-C' showing preliminary borrow area cuts and sediments (See Figure 11 for location). Cross-section is based on interpolation of 2005 vibracore data. Gray shaded areas representing thin layers of Marginal "B" Sand were interpreted from seismic records between vibracores).

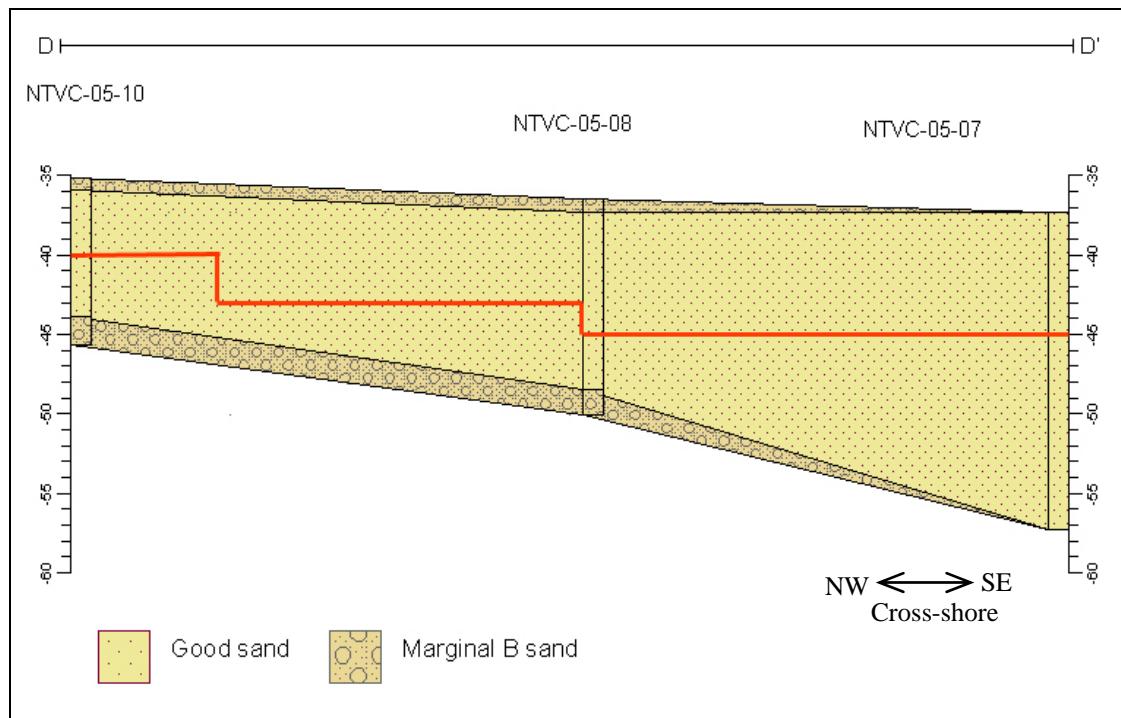


Figure 18. Cross-section D-D' showing preliminary borrow area cuts and sediments (See Figure 11 for location). Cross-section is based on interpolation of 2005 vibracore data.

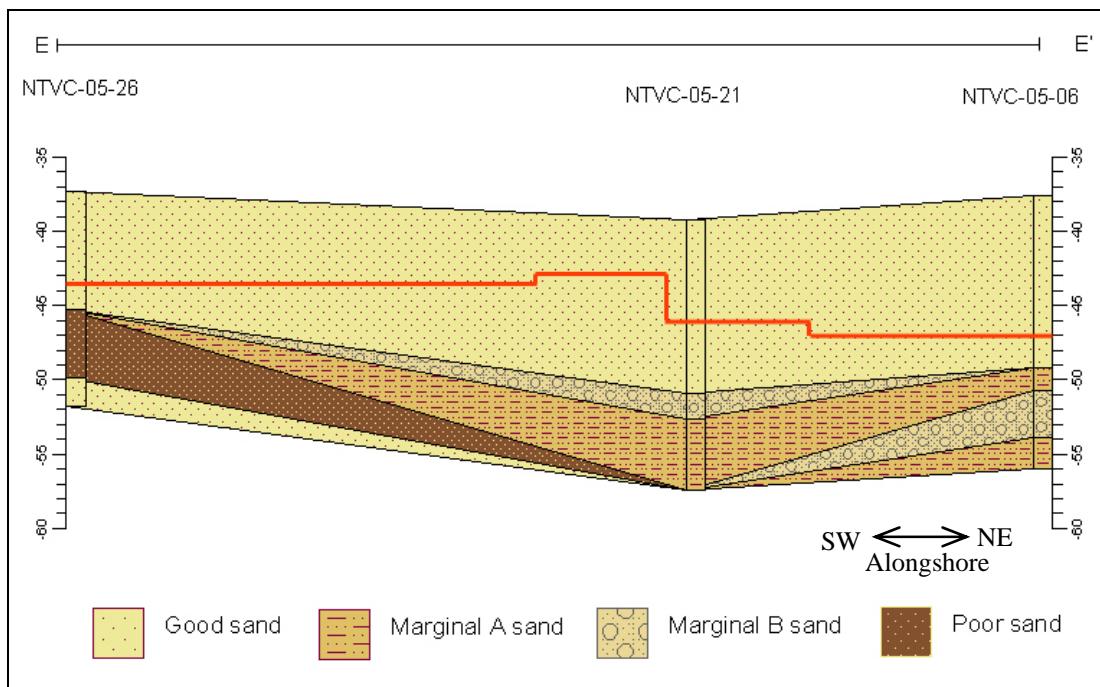


Figure 19. Cross-section E-E' showing preliminary borrow area cuts and sediments (See Figure 11 for location). Cross-section is based on interpolation of 2005 vibracore data.

Sediment thickness is also reduced between vibracores NTVC-05-12 and NTVC-05-06 and the borrow area cut is interrupted in this location (gray shading in cross- section C-C', Figure 17) where the borrow area is segmented into two main sections (refer to Figure 14 for borrow area planform). Cross-section D-D' (Figure 18), which cuts the borrow area in a cross-shore direction in the northeast (see Figure 14 for location); shows offshore sedimentary thickening in the northern segment with included thin layers of gravelly sands. Poor sediments in basal layers of cross-section E-E' (Figure 19), oriented in a shore-parallel direction, were interpreted from vibracores NTVC-05-26, NTVC-05-21 and NTVC-05-06 (refer to Figure 14 for location). Borrow area cuts indicate at least a 2 ft. buffer separating these poor quality basal sediments (Figure 19).

### Borrow Area Composite Characteristics

Borrow area shape, cuts, and locations of twenty-seven (27) vibracores used in the development of the borrow area, are shown in Figure 20. The stratigraphy of sedimentary materials in the borrow area is summarized in selected cross-sections (Figures 15 thru 19) that show interpreted sediment quality. Two borrow area cuts shown in Figure 20 contain coarser sediments because they fall within a secondary incised channel within the larger depression comprising most of the borrow area (Figure 20). This secondary feature was interpreted by CPE using seismic survey data. Sand subsamples were collected from the vibracores for analytical purposes. Composite mean grain size for this secondary deposit of coarser sand is 0.33 mm. Additionally composite percent silt, and sorting were computed for each vibracore by calculating the weighted average (average of each sample weighted by representative core length), and are included in the Geotechnical Appendices along with vibracore logs, and photographs.

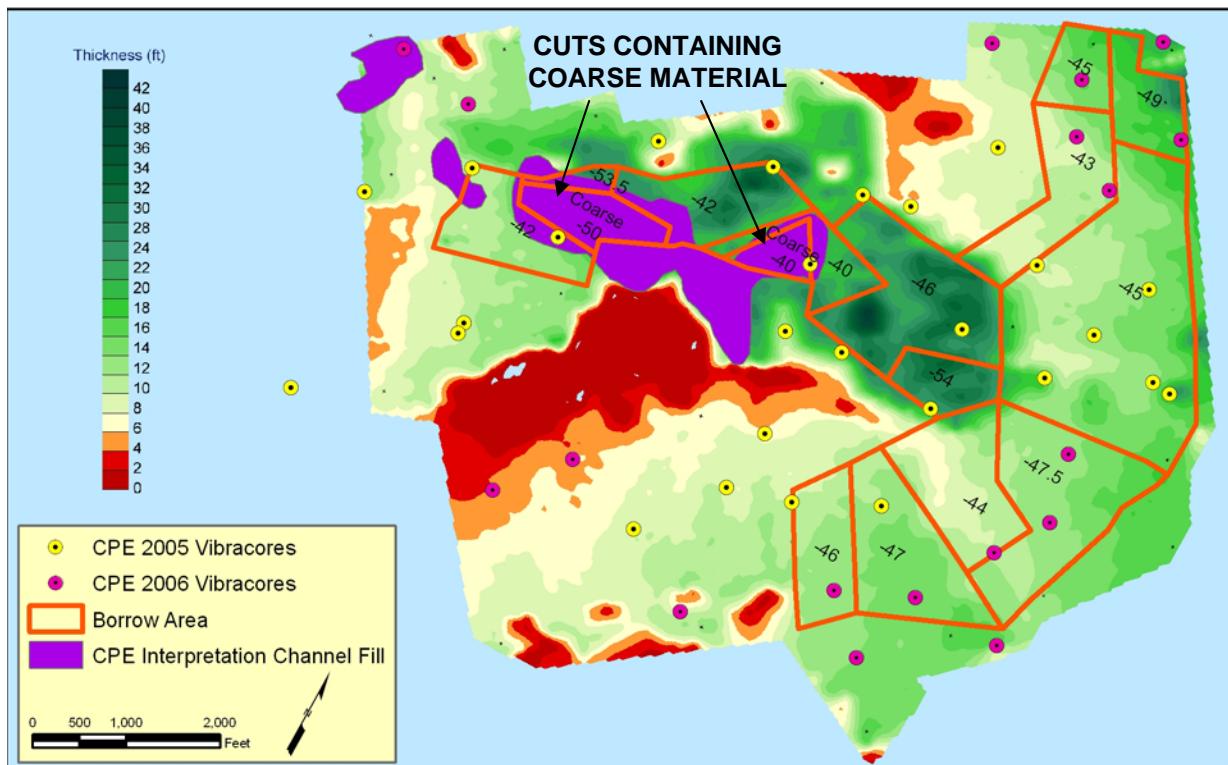


Figure 20. Map depicting borrow area isopachs and design cuts showing the location of vibracores and depth of cut for each individual cut within the borrow area. Note two cuts that contain coarse material in purple “Coarse” areas.

Volume calculations and sediment characteristics were performed separately for the coarse cuts in the depression and remaining borrow area. Summary results (composites) indicate that the borrow area, excluding the two coarse cuts, contains a mean grain size of 0.21 mm (fine sand), with a phi sorting of 1.02 (poorly sorted), and 6.4% silt content and contains 6.69 million cy (Table 2). Summary results (composites) for the two coarse cuts indicate a mean grain size of 0.33 mm (fine sand), with a phi sorting of 0.57 (moderately well sorted), and 1.75% silt content (Table 2). The two coarse cuts contain 356,839 cy of sand. Borrow area textural characteristics are summarized in Table 2. The total volume contained in the offshore borrow areas is 6.55 million cy of sand.

Depths of cut range from -54 ft. to -39.5 ft. referenced to North American Vertical Datum 1988 (NAVD88), with deeper cuts in the center of the borrow area where sandy sediments infill the depression. Depths of cut near the corners of the borrow area are mostly within 40 to 50 ft. The final design cuts, location of vibracores, and isopachs are shown in Figure 17. A two-foot buffer in the borrow area design separates extractable sand from underlying sediments that are not suitable for beach nourishment. Material below the two-foot buffer should be avoided during dredging.

Table 2. *Borrow area volumes and textural characteristics.*

	Borrow Area (Acres) *	Coarse cuts
Mean Grain Size (mm)	0.21	0.33
Phi Sorting	1.02	0.57
Silt Percentage (%)	6.4	1.75
Volume	6,194,454	356,839

\* Excludes the two coarse cuts shown in Figure 17.

## GEOTECHNICAL INVESTIGATIONS IN NEW RIVER INLET

Based on analysis of historical aerial photographs and a hydrodynamic model (ADCIRC®), a channel design alternative (Alternative 3) was selected to re-orient the main channel of New River Inlet to the south in order to provide the hydrodynamic and morphological changes that would be conducive to migration of the ebb-tidal delta southwards, protecting the north end of North Topsail Beach (see engineering section). Geotechnical investigations for New River Inlet associated with the design of a re-oriented channel included a June 2003 hydrographic survey of the inlet and subsurface sampling of the sediment in the ebb-tidal delta using jet probes and vibracores. An August 2005 hydrographic survey of the inlet complex, a July 2006, and a November 2008 vibracore survey of the ebb-tidal delta were also conducted.

### Hydrographic Surveys

The hydrographic survey of New River Inlet, conducted by CPE-NC in June 2003, is shown in Figure 21. Also indicated in Figure 21 are the locations of the jet probes and vibracores obtained by CPE-NC in 2003. CPE resurveyed the inlet in August 2005. The results of this survey are shown as a 3D color-ramped surface in Figure 22, which shows the extent of the ebb-tidal delta and the orientation of the ebb channel. Between June 2003 and August 2005, the orientation of the bar channel shifted from a 95° azimuth to a 103° azimuth.

### Jet Probes

Twenty (20) jet probes (Figure 23) were obtained in New River Inlet and Cedar Bush Cut. The preliminary proposal for modification to New River Inlet included possible widening and deepening of Cedar Bush Cut. Modification of Cedar Bush Cut has been eliminated from the plan because of possible adverse environmental impacts, as expressed by Federal and State resource agencies during early Project Delivery Team (PDT) meetings. Proposed modification for New River Inlet would begin in the gorge of the inlet (deep-water area between North Topsail Beach and Onslow Beach) and extend seaward across the ebb-tidal delta. Accordingly, only jet probes JP-07 to JP-20 are applicable to the proposed new channel. Although not presently under consideration, results of jet probes in Cedar Bush Cut are presented for completeness of investigation. Grain size information for the individual jet probes is available in report appendices.

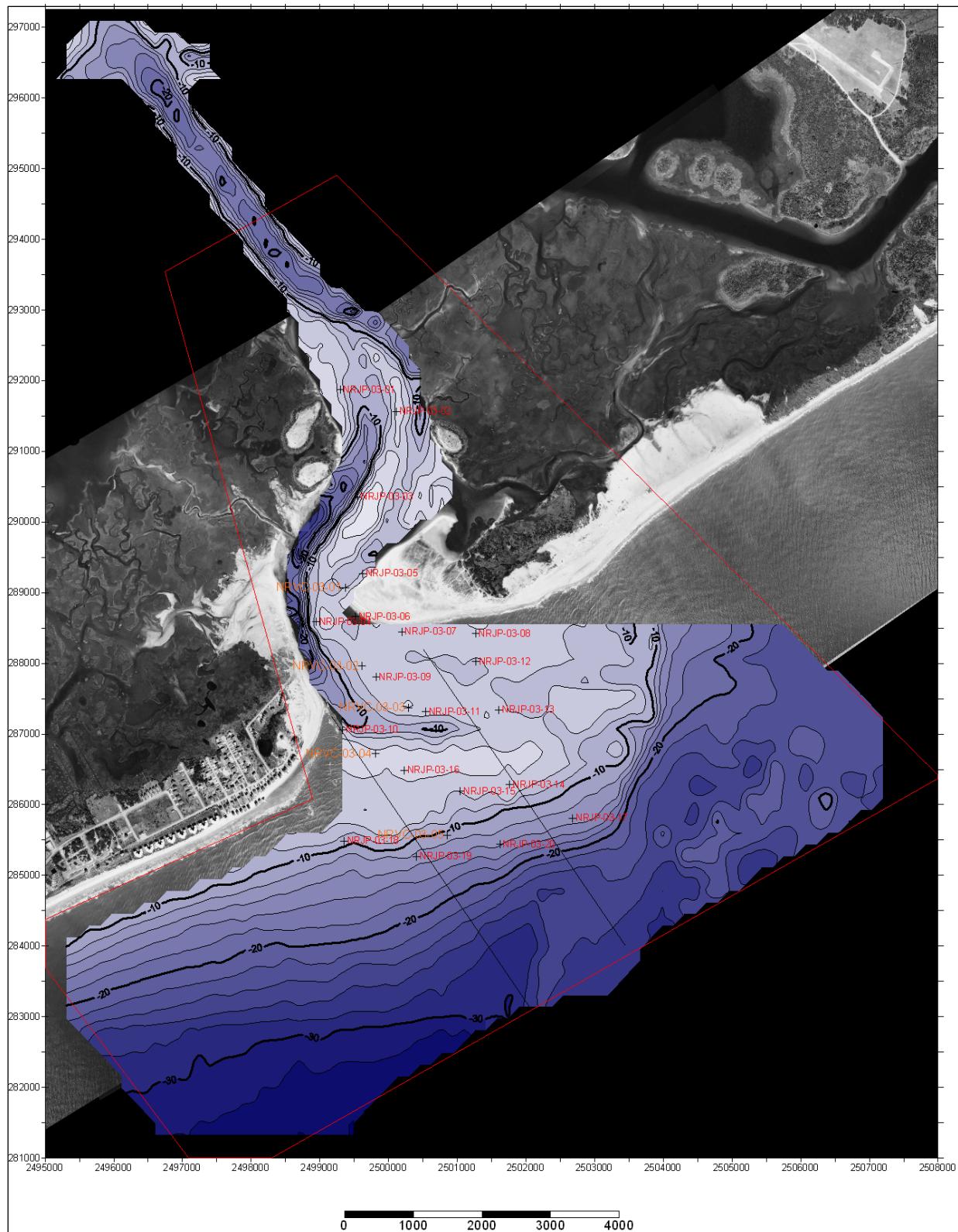


Figure 21. June 2003 hydrographic survey of New River Inlet showing location of 2003 jet probes and vibracores.

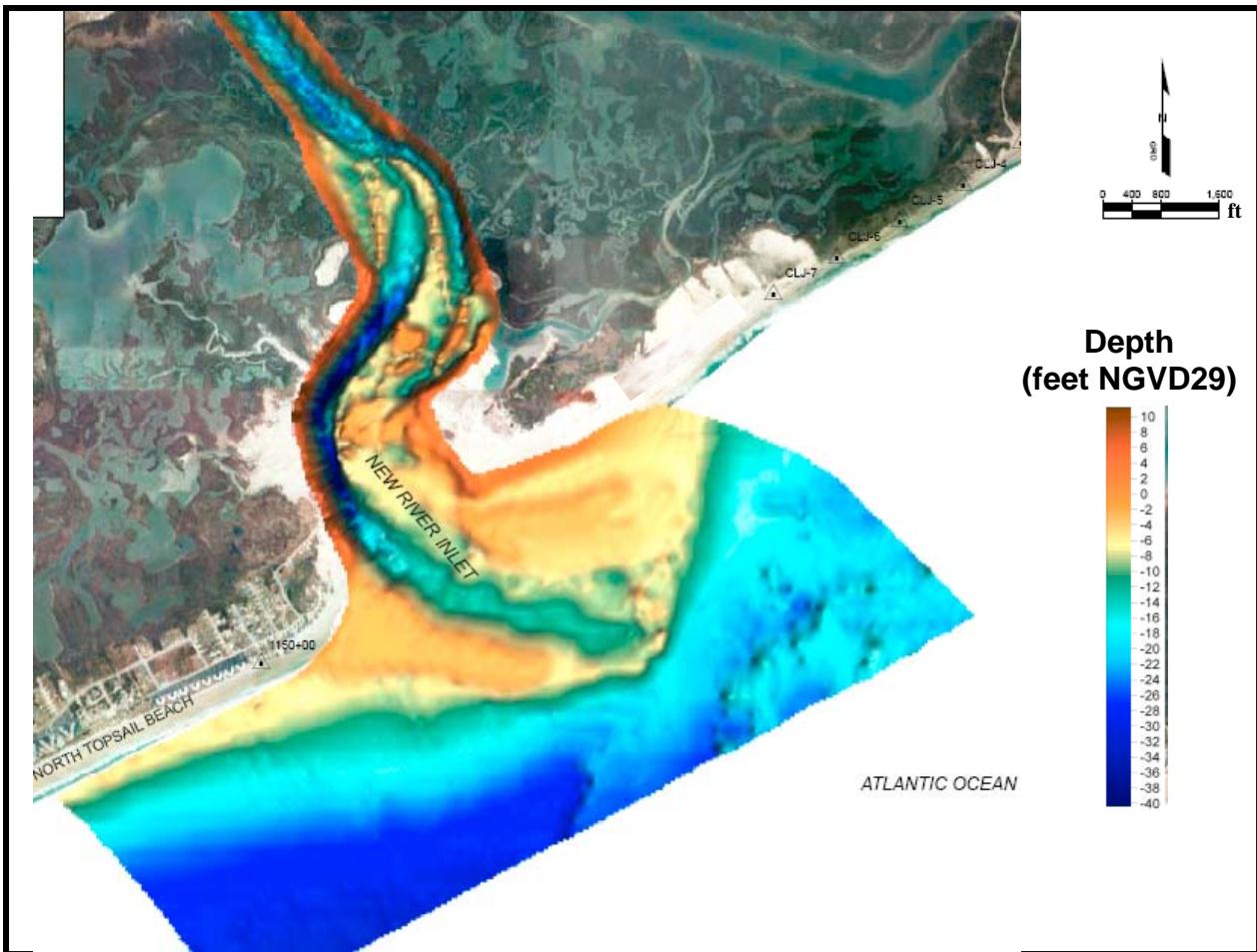


Figure 22. August 2005 hydrographic survey of New River Inlet showing the orientation of the ebb channel and the ebb-tidal delta.

The jet probe grain-size data provided a preliminary assessment of the type of sediment contained in the New River Inlet complex which includes the ebb-tidal delta and the seaward portion of Cedar Bush Cut. Jet probe samples obtained from the mid-depth of probes 01, 02, 03, and 05, located near the seaward end of Cedar Bush Cut (Figure 20), had an average mean grain size of 0.26 mm and contained approximately 0.56% gravel by weight (grain size equal to or greater than 4.76 mm). Near the throat of the inlet, represented by jet probes 04, 06, and 07, the mid-depth samples were much coarser, averaging 0.95 mm and had an average gravel content of 4.88%. Jet probes NRJP-03-09, 10, and 11, taken on the middle portion of the ebb-tidal delta, had an average mean grain size of 0.40 mm and did not contain any gravel or pockets of clay. Over the outer edge of the ebb-tidal delta (jet probes 14, 15, 17, and 20) the mean grain size of the jet probe samples averaged 0.27 mm. This section of the ebb-tidal delta did not contain any gravel or pockets of clay. The differing characteristics of material found in these four zones of the inlet complex are influenced by variation in wave and tidal current energy in each zone with the coarser-grained sediments found in high energy zones, associated with the inlet throat and smaller grain sizes (and less gravel) found in Cedar Bush Cut and on the seaward side of the inlet throat.

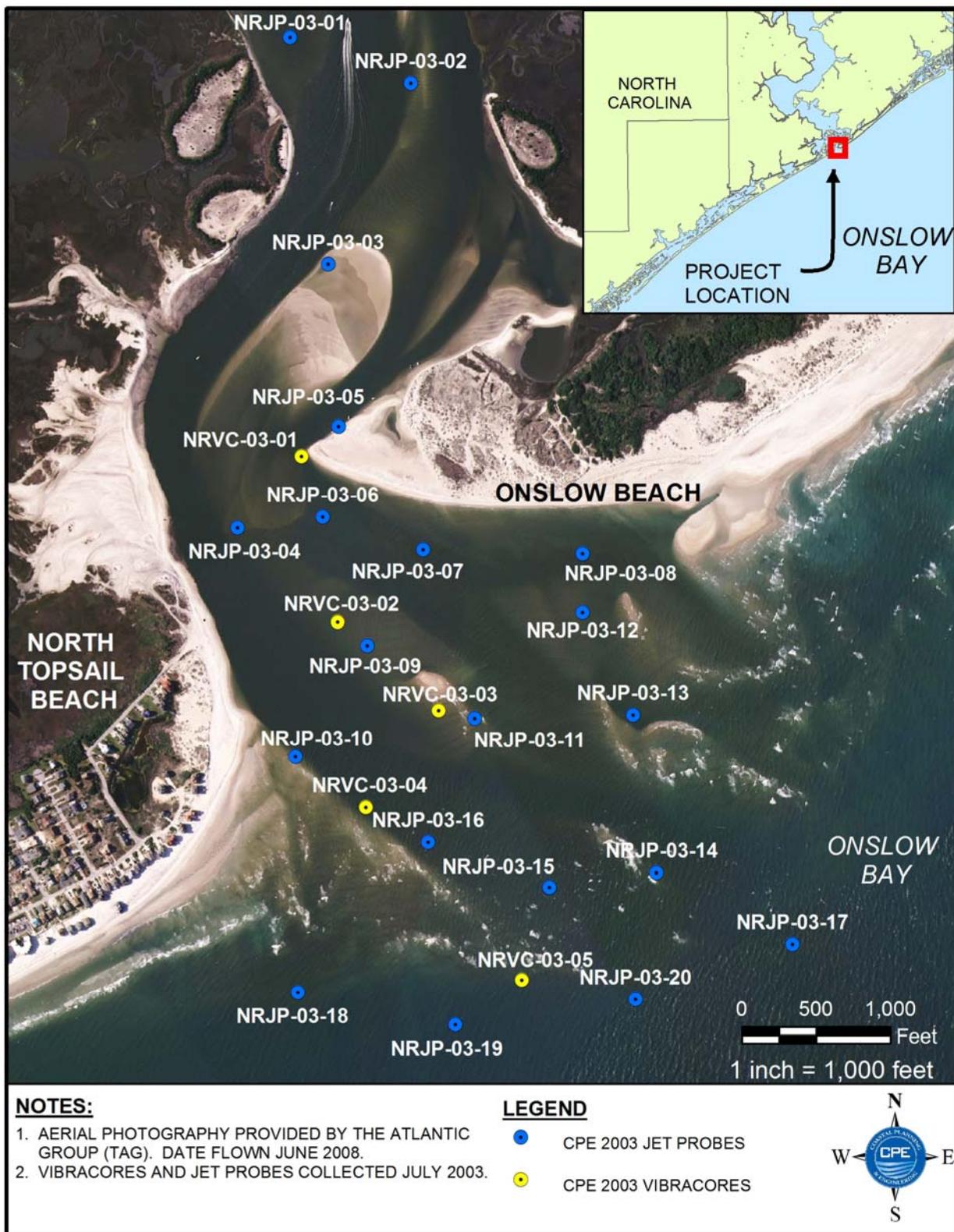


Figure 23. Location of 2003 CPE jet probes (NRJP) and CPE vibracores (NRVC).

## Vibracores

Athena Technologies of Columbia, South Carolina, under the direction of a CPE-NC geologist, drilled five (5) vibracores in New River Inlet between July 22 and July 25, 2003. CPE vibracore locations (designated as VC-01, VC-02, *etc.*) are shown in Figure 23. The majority of the CPE vibracores were taken in two or three phases. In the first phase, a 3-inch galvanized steel tubing or a 5-inch diameter aluminum tubing was vibrated into the sediment to a depth of eight (8) to twelve (12) feet. This was followed by jetting a 3-inch galvanized steel tubing to the depth of recovery and then vibrating the 3-inch galvanized steel tubing into the sediment to a depth of twenty (20) feet or until the vibracore hits refusal. If this first 3-inch galvanized steel tubing attempt did not recover a core of sufficient length, a second 3-inch galvanized steel tubing was jetted to one foot less than the depth of recovery (to provide data overlap) of the first jetted galvanized steel tubing and then vibrated into the sediment to a depth of twenty (20) feet or until the vibracore hits refusal. Each core was measured and labeled onboard the vessel. At the end of each day, the cores were transported to shore where they were cut lengthwise, visually inspected, and sealed in plastic. At the end of the vibracoring operations, archived halves of cores were transported to the University of North Carolina at Wilmington and the sampled half was transported to the CPE Boca Raton, Florida, office for sampling, grain-size analysis, and logging. Grain size information for individual vibracores is available in report appendices.

Following a cultural resource survey completed by Tidewater Atlantic Research, Inc. (TAR) between 5 October and 6 November 2004, the channel design was modified due to the identification of several magnetic anomalies (TAR, 2005). Several anomalies identified by TAR were thought to be potentially significant cultural resources. The proposed channel location was moved to the southwest (to the North Topsail Beach Side) of the inlet complex, necessitating the collection of two additional vibracores. These vibracores (NTVC-06-19 and NTVC-06-20) were collected by American Vibracore Services, Inc. (AVS) in July 2007 in the same method as described previously for the offshore borrow area investigation (Figure 24).

The grain size information from the vibracores follows the same general trend as the jet probes. That is, the coarsest material is located in the inlet throat and the middle portions of the ebb-tidal delta. The vibracore data also indicates that the mean grain size, gravel concentrations, and shell content increases with depth, as shown in Table 4. In this regard, the gravel and shell content increases significantly for depths greater than -17 ft. NGVD29. Based on the State of North Carolina sediment standards for beach nourishment material, the gravel content for the material located below -17 ft. NGVD29 would exceed the amount that would be allowed for North Topsail Beach. As discussed previously, the percent gravel by weight for native material on North Topsail Beach is 0.43%. The State standards allow the borrow material to contain 5% above the native or 5.43%. Also, carbonate percent (shell content) below -17 ft. NGVD29 is very close to that which is allowed for North Topsail Beach (new State limit would be 40.83%). Therefore, based only on the *in situ* sediment characteristics, the depth of the new channel should be limited to -17 ft. NGVD29 (-18 ft. NAVD88, -15 ft. MLW).

Following the release of the Draft EIS in November 2007, a review of the draft geotechnical report by the North Carolina CRC, indicated that in order to comply with the North Carolina technical standards for beach fill projects a minimum of ten (10) vibracores must be

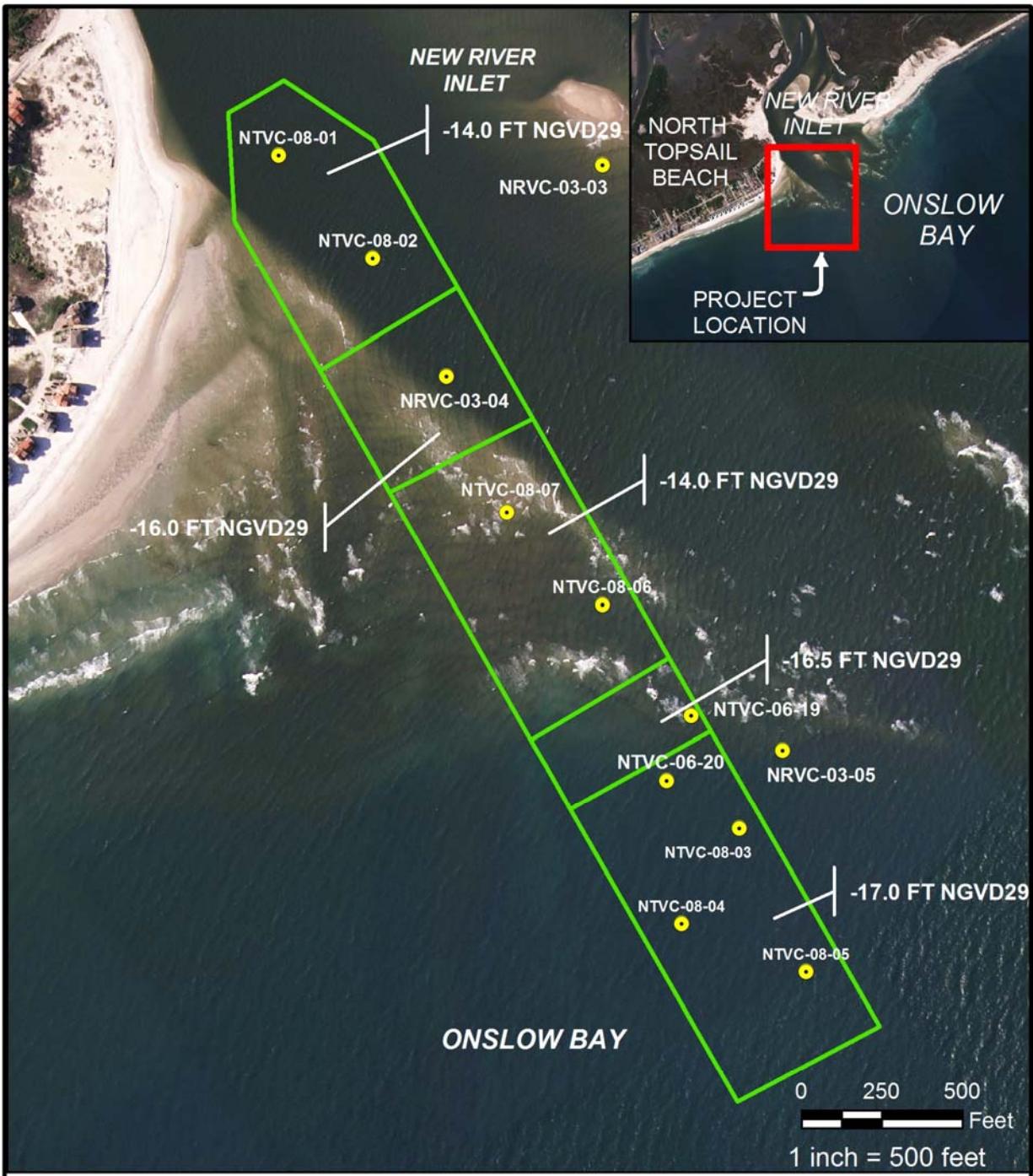


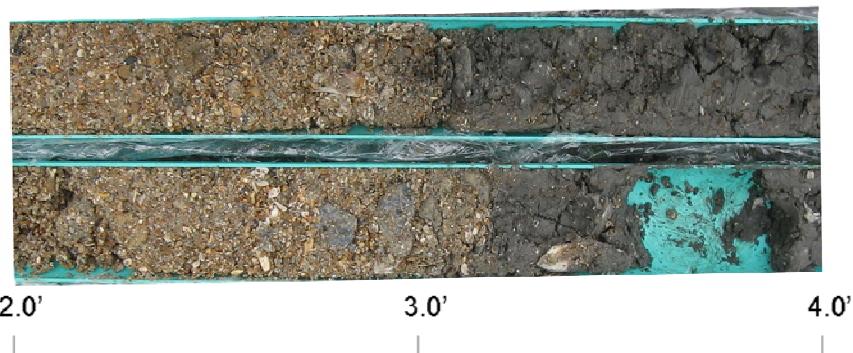
Figure 24. Map depicting locations of New River Inlet vibracores and channel design. Note cut depths shown indicate deepest depth within each cut that material will be placed on the beach. Material below these depths down to -17.0 FT. NGVD29 will be placed in the upland disposal.

taken inside of the borrow site. At the time of the Draft EIS three (3) vibracores were located within the footprint of the proposed channel due to the readjustment of the channel position to avoid potential cultural resource impacts. In November 2008, Athena Technologies of Columbia, South Carolina, under the direction of a CPE-NC geologist, drilled seven (7) additional vibracores in New River Inlet (Figure 24). Upon collection and analysis of these additional vibracores, it was discovered that discontinuous layers of clay at varying depths were present in portions of the designed channel. Clay sediments were identified above the proposed bottom channel depth of -17 ft. NGVD29 in vibracores NTVC-08-01, NTVC-08-02, and NTVC-08-06 (Figure 25).

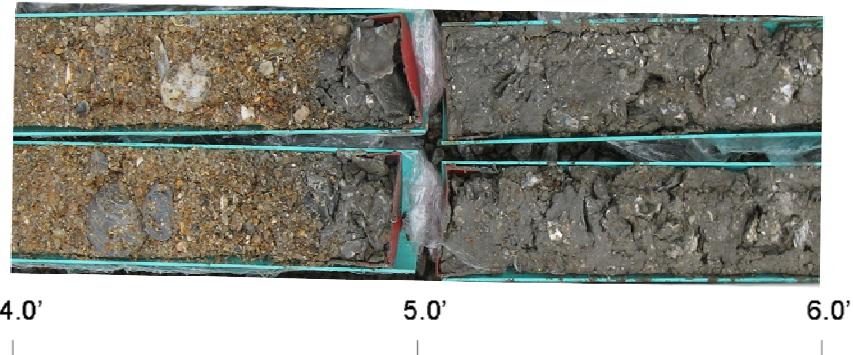
Due to the occurrence of these clay layers within the designed channel and the incompatibility of the clay on the native beach, an alternative borrow area design was developed. As indicated in the Draft EIS (CPENC, 2007) and the geomorphic analysis included in Appendix B of the Draft EIS (CPENC, 2007), a channel oriented perpendicular to the adjacent shorelines, closer to the north end of North Topsail Beach, would provide positive shoreline benefits for the adjacent oceanfront shorelines. Maintenance of the designed channel to a depth of -17.0 ft. NGVD29 (-18.0 ft. NAVD88) in the preferred position and along the preferred alignment is critical for the recovery of the extreme northern end of the Town's shoreline. Therefore, the Town of North Topsail Beach in coordination with CPENC determined to maintain the inlet channel design as presented in the Draft EIS (CPENC, 2007) and dispose of the underlying clay material within the design template on an upland disposal site located at the junction of the Intracoastal Waterway and New River Inlet (Figure 26). In order to establish maximum cut depths to avoid and minimize placing incompatible material on the beach, the channel template was split into five (5) different cuts with differing bottom of cut elevations (Figure 24). All material below these cut depths down to a bottom of channel depth of -17.0 ft. NGVD29 (-18.0 ft. NAVD88) will be placed in the above mentioned upland disposal site. In addition, avoidance and minimization procedures have been outlined in Section 6 of the Final EIS (CPENC, 2009), which describe the procedures to be employed to avoid placement of incompatible clay material on the beach.

The composite characteristics of the inlet material located within the design cuts to be disposed of on North Topsail Beach and located above the clay material include a mean grain size of 0.39 mm, 1.35 phi sorting (poorly sorted), and 1.53% silt. The total volume of the channel design cut using a side slope of 1:5 is 635,800 cy. Of this volume, 544,400 cy of material is beach compatible and 91,400 cy is incompatible material. These volumes are based on the 2005 survey of the channel. Given the dynamic nature of the inlet, these volumes are subject to change.

**NTVC-08-01 (2' – 4')**



**NTVC-08-02 (4' – 6')**



**NTVC-08-06 (12' – 14')**



Figure 25. Digital photographs of vibracores NTVC-08-01, 02, and 06, which contained deposits of incompatible clay material.



Figure 26. Map depicting the location of the upland disposal site, located at the junction of the AIWW, Cedar Bush Cut, and New River, in which incompatible material from the New River Inlet channel will be deposited.

### BEACH COMPATIBILITY ANALYSIS

Based on the requirements of the Technical Standards for Beach Fill Project for the State of North Carolina (15A NCAC 07H.0312), detailed analyses were performed to determine the percentages of silt, granular, and gravel-sized clasts, as well as the percentage of carbonate by weight and quantity of clasts (*i.e.* number of clasts) greater than three inches in the native beach. The State standards require percent silt, granular, and gravel in fill material not to exceed the amount found in the native beach plus five (5) percent. Likewise, North Carolina standards require the percent carbonate infill not to exceed the amount found in the native beach plus fifteen (15) percent.

Results of the native beach analysis for North Topsail Beach show that the percent silt within the native material is 1.5%. Likewise, the percent granular and gravel for the beach were determined to be 1.07% and 0.43% respectively. The results of the carbonate analysis of the native beach show a percent by weight carbonate for the native beach of 25.8%. Given the criteria set forth by the State of North Carolina, all fill material complies with the State standards as shown in Table 3.

Table 3. *Results of compatibility analysis between the native beach and borrow area material*

	% Silt	% Carbonate	% Granular	% Gravel	Volume (cubic yards)	Acreage
Native Beach	1.5	26	1.07	0.43		
State Standard Allowance	5	15	5	5		
State Standard Cutoff	6.5	41	6.07	5.43		
Offshore BA (Fine)	6.4	16	1.13	1.43	6,194,454	458.9
Offshore BA (Coarse)	1.75	20	0.63	0	356,839	22.7
Channel Borrow Area*	1.53	22	5.38	3.64	544,400	45.0
<b>Total Volume of Borrow Areas</b>					<b>7,095,693</b>	

\* These values represent the sand fraction above the cut depth specified for each cut as seen in Figure 21, and not all material to be dredged from New River Inlet.

The results of the survey to quantify the amount of rocks and shells > 3 inches in diameter are shown in Table 4. This survey was performed in the vicinity of USACE baseline station 1070+00 in June 2007 prior to construction to determine a background value for the amount of rock and shell > 3 inches in diameter on the recipient beach. The total number of clasts > 3 inches in diameter identified during the survey was 3,421.

## CONCLUSIONS

Investigation of an area on the inner continental shelf offshore of North Topsail Beach, and in the channel section and ebb-tidal delta of New River Inlet was surveyed in an effort to locate suitable sand sources for the North Topsail Beach Nourishment Project. A rational sequence of geotechnical and geophysical investigations, based on CPE strategic sand search protocols, was adapted to local shelf conditions. These protocols featured analysis of historical data, determination of local coastal geological frameworks, comprehension of regional morphodynamics, and performing preliminary reconnaissance geophysical and geotechnical surveys that included on-the-fly analysis of geophysical data and vibracores in the field. Application of these procedures resulted in the identification of beach-compatible sands infilling a depression that cut into the underlying rock strata, interpreted to be Oligocene in age (WILLSON, 2009), during low stands of sea level.

Beach sediments located in the New River Inlet channel and ebb-tidal delta are suitable for placement on the beach as are the sediments identified in the offshore investigations. The offshore borrow area was divided into two sections, a section with finer grain size (composite mean grain size of 0.21 mm) that contains 6.19 million cy of sand within 458.9 acres, and a coarser section (composite mean grain size of 0.33 mm) that contains 356,839 cy of sand within 22.7 acres. The inlet design cuts which delineate the bottom of the sand filled cuts to be placed

Table 4. Results of the survey to determine the amount of clasts > 3 inches in diameter. Note that abbreviations at corners are in reference to the orientation of the rows and columns set up along the each for the survey (SW refers to southwest corner, NW refers to northwest corner, etc.)

SW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	NW
A	9	12	9	8	8	6	17	24	18	25	39	19	14	10	10	9	3	2	5	17	4	5	4	5	11	11	15	21	
B	41	43	15	19	11	21	22	11	5	8	8	7	13	12	8	4	12	12	5	10	6	12	11	11	10	6	9	20	
C	13	9	6	17	15	7	11	8	27	40	8	10	16	34	23	24	33	37	42	32	23	30	32	31	49	30	33	25	
D	57	40	24	38	39	20	21	28	29	38	26	27	28	13	26	45	30	35	12	17	31	40	29	20	60	27	59	68	
E	8	21	8	11	3	9	8	10	8	12	12	14	5	0	8	22	8	5	0	1	3	1	4	1	3	2	13	14	
F	3	4	7	4	4	1	8	6	8	4	5	6	13	17	39	14	15	19	27	9	6	5	2	1	2	2	3	7	
G	5	19	21	5	2	13	14	2	15	21	2	1	10	20	14	18	15	16	8	6	17	12	20	6	10	14	9	3	
H	0	0	2	1	3	3	2	1	0	1	1	0	0	6	3	1	1	4	3	7	5	22	19	3	10	5	4	3	
I	0	0	2	1	0	1	0	0	0	0	2	1	0	1	1	0	0	1	1	2	1	3	3	1	0	1	0		
J	0	2	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	2	0	2	0	0	0	1	
K	0	0	1	3	1	2	1	1	0	2	1	1	6	6	1	2	6	1	1	0	4	1	2	0	3	1	1	2	
L	5	10	10	3	4	0	1	0	5	8	5	0	0	0	0	0	0	0	0	2	4	3	0	0	0	2	1	0	
M	4	4	1	7	3	0	0	1	0	8	1	1	1	0	0	0	0	1	1	0	1	0	0	3	2	1	1		
N	1	4	2	3	0	0	0	0	0	6	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0		
O	1	0	0	0	3	1	0	0	0	1	2	1	0	1	0	0	0	2	0	0	1	0	0	0	0	0	0		
P	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
Q	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0		
R	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0		
SE	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0		
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

on the beach contains 544,400 cy of sand (composite mean grain size of 0.39 mm) within 45.0 acres. Total volumes identified in these three zones (inlet, offshore finer, offshore coarser) total 7.10 million cy of sand.

## REFERENCES CITED

- ASTM, 1987. Standard method for particle-size analysis of soils, designation D422-63. *1987 Annual Book of ASTM Standards, volume 04.08: Soil and Rock; Building Stones; Geotextiles*. Philadelphia: American Society for Testing Materials.
- BACKSTROM, J.T.; WILLSON, K.T.; MCLEOD, M.A., and CLEARY, W.J., 2001. A reconnaissance study of shoreface sand resources off a storm impacted barrier: Surf City, North Carolina. *Geological Society of America 50<sup>th</sup> Annual Meeting, Southeastern Section, Session 54: Marine and Coastal Science, and Sediments, Program and Abstracts*, Abstract 3468.
- BLACKWELDER, B.W., MACINTYRE, I.G., and PILKEY, O.H., 1982. Geology of the continental shelf, Onslow Bay, North Carolina, as revealed by submarine outcrops. *American Association of Petroleum Geologists, Bulletin*, v. 66, 44-56.
- CLEARY, W.J.; HOSIER, P.E., and WELLS, J., 1976. Genesis and significance of marsh islands in southeastern North Carolina lagoons. *Journal of Sedimentary Petrology*, 49, 703-710.
- CLEARY, W.J. and HOSIER, P.E., 1987. Onslow Beach, North Carolina: morphology and stratigraphy. *Proceedings Coastal Sediments '87* (New Orleans) (ASCE), pp. 1745-1759.
- CLEARY, W.J. and RIGGS, S.R., 1999. *Beach Erosion and Hurricane Protection Plan for Onslow Beach, Camp Lejeune, North Carolina*. Camp Lejeune, North Carolina: United States Marine Corps, Comprehensive Geologic Characteristics Report (unpublished), 137p.
- CLEARY, W.J.; HOSIER, P.E., and WELLS, J., 1976. Genesis and significance of marsh islands in southeastern North Carolina lagoons. *Journal of Sedimentary Petrology*, 49, 703-710.
- CLEARY, W.J., JARRETT, J.T., SAULT, M., JACKSON, C.W., and WELSH, J.M., 2003. Inlet-induced shoreline changes: Linkage between channel migration and ebb-tidal delta reconfiguration, Bogue and New River Inlets, North Carolina. *Coastal Sediments '03 (5<sup>th</sup> International Symposium on Coastal Engineering and Science of Coastal Sediment Processes)*, CD-ROM.
- CLEARY, W.J., AND PILKEY, O.H., 1968. Sedimentation in Onslow Bay, *In: Guidebook for Field Excursions: Durham, North Carolina*. Geological Society of America, Southeastern Section, Southeastern Geology, Special Publication 1, p. 17.
- CLEARY, W.J.; RAUSCHER, M.A.; MCLEOD, A.; JOHNSTON, M.K., and RIGGS, S.R., 2001. Beach nourishment on hurricane impacted barriers in southeastern North Carolina, USA: Targeting shoreface and tidal inlet sand resources. *Journal of Coastal Research* (ICS 2000 Proceedings), pp.1-7.
- CLEARY, W.J., RIGGS, S.R., MARCY, D.C., and SNYDER, S.W., 1996. The influence of inherited geological framework upon a hardbottom-dominated shoreface on a high—energy shelf: Onslow Bay, North Carolina, USA. *In: DE BATIST, M. and JACOBS, P. (eds.), Geology of Siliciclastic Shelf Seas*. Geological Society Special Publication No. 117, pp. 249-266.
- COASTAL BARRIER RESOURCES ACT, 1982. (16 U.S.C. 3501).

COASTAL PLANNING & ENGINEERING OF NORTH CAROLINA, INC. (CPENC) 2007. Draft EIS: North Topsail Beach Shoreline Protection Project, North Topsail Beach, North Carolina. Prepared for the Town of North Topsail Beach, North Carolina.

COASTAL PLANNING & ENGINEERING OF NORTH CAROLINA, INC. (CPENC) 2009. Final EIS: North Topsail Beach Shoreline Protection Project, North Topsail Beach, North Carolina. Prepared for the Town of North Topsail Beach, North Carolina.

FINKL, C.W.; ANDREWS, J., and BENEDET, L., 2003. Shelf sand searches for beach renourishment along Florida Gulf and Atlantic coasts based on geological, geomorphological, and geotechnical principles and practices. *Proceedings of Coastal Sediments 03* (March 2003, Clearwater, Florida). Reston, Virginia: American Society of Civil Engineers, CD-ROM.

FINKL, C.W.; ANDREWS, J.L.; CAMPBELL, T.J.; BENEDET, L., and WATERS, J.P., 2004. Applying geologic concepts coupled with historical data sets in a MIS framework to prospect for beach-compatible sands on the inner continental shelf on the eastern Texas Gulf coast. *Journal of Coastal Research*, 20(2), 533-549.

FINKL, C. W. and BENEDET, L. A., 2003. Jet Probes, Jet Probing. In: The Encyclopedia of Coastal Science, Dordrecht: Kluwer Academic Publishers.

FINKL, C. W., KHALIL, S.M. and ANDREWS, J.L. (1997) Offshore sand sources for beach replenishment: potential borrows on the continental shelf of the eastern Gulf of Mexico. *Marine Georesources and Geotechnology*, 15,155-173.

FINKL, C.W. and KHALIL, S.M., 2005. Offshore exploration for sand sources: General guidelines and procedural strategies along deltaic coasts. *Journal of Coastal Research*, Special Issue No. 44, 198-228.

FITZGERALD, D.M., 1984. Interactions between the ebb-tidal delta and landward shoreline: Price Inlet, South Carolina. *Journal of Sedimentary Petrology*, 54, 1303-1318.

FOLK, R.L., 1974. *The Petrology of Sedimentary Rocks*, Austin, Texas. Hemphill Publishing Company, 182p. FSTM, 2000. Florida test method for carbonates and organic matter in base materials. Designation FM 5-514. 2000. Gainesville, Florida: State Materials Office.

HAYES, M.O. 1979. General morphology and sediment patterns in tidal inlets. *Sedimentary Geology*, 28, 139p.

JOHNSTON, M.K., 1998. *The Inherited Geologic Framework of the New River Submarine Headland Complex, North Carolina, and its Influence on Modern Sedimentation*. Wilmington, North Carolina: University of North Carolina at Wilmington,, Master's Thesis, 127p.

MACINTYRE., I. G. and PILKEY, O. H., 1969. Preliminary comments on linear sand/surface features, Onslow Bay, North Carolina continental shelf: problems in making detailed sea-floor observations. *Maritime Sediments*, 1, 26-29.

MILLIMAN, J.D., 1972. Atlantic Continental Shelf and Slope of the United States – Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida: United States. *Geological Survey Professional Paper* 529-J, 40p.

NCDCM (North Carolina Division of Coastal Management), 2007. 15A NCAC 07H .0312 Technical Standards for Beach Fill Projects. Rule as adopted by the RRC on 1/18/2007 (with changes, as published in 21:03 NCR 263), effective 2/1/2007.

- RIGGS, S.R.; CLEARY, W.J., and SNYDER, S.W. 1995. Influence of inherited geologic framework on barrier shoreface morphology and dynamics. *Marine Geology*, 126, 213-234.
- RIGGS, S.R.; CLEARY, W.J., and SNYDER, S.W., 1996. Morphology and dynamics of barrier and headland shorefaces in Onslow Bay, North Carolina. In: Cleary, W.J. (ed.), *Environmental Coastal Geology: Cape Lookout to Cape Fear, NC*. Durham, North Carolina: Carolina Geological Society, Fieldtrip Guidebook 1996, pp. 33-47.
- SNYDER, S.W., HINE, A.C., AND RIGGS, S.R., 1982. Miocene seismic stratigraphic, structural framework, and sea-level cyclicity, North Carolina Continental Shelf. *Southeastern Geology*, 23 (4), 247-266.
- SNYDER, S.W.; HOFFMAN, C.W., and RIGGS, S.R., 1994. Seismic stratigraphy framework of the inner continental shelf: Mason Inlet to New Inlet, North Carolina. *North Carolina Geological Survey Bulletin No. 96*, 59p.
- TIDEWATER ATLANTIC RESEARCH, INC. (TAR), 2005. Historical Research and a submerged Cultural Resources Remote Sensing Survey New River Inlet Channel Realignment, Onslow County, North Carolina. Prepared for Coastal Planning & Engineering, Inc. Boca Raton, Florida.
- WILLSON, K.T. and CLEARY, W.J., 2003. Targeting offshore sand resources for high hazard zones along southeastern North Carolina, USA. *Coastal Sediments'03 (5<sup>th</sup> International Symposium on Coastal Engineering and Science of Coastal Sediment Processes)*, CD-ROM.
- WILLSON, K.T., 2009. *Shoreface mapping and sand resource inventory: Surf City and North Topsail Beach, North Carolina*. Wilmington, North Carolina: University of North Carolina at Wilmington, Department of Geology. Masters Thesis.

## APPENDIX OVERVIEW

**Introduction:** These appendices contain the results from vibracores and jet probe field investigations and analysis of the resulting sand samples. The results of the New River Inlet and Offshore sand search and native beach compatibility are provided in vibracore and jet probe logs, vibracore photographs, composite summary tables, grain size distribution curves/histograms and granularmetric reports, and digital subbottom profile records. A total of fourteen (14) vibracores and twenty (20) jet probes were collected for the New River Inlet investigation. A total of forty-eight (48) vibracores and fourteen (14) jet probes were collected for the offshore investigation.

Due to the complexity of this project and the multiple stages in which investigations have been conducted, several different vertical datum have been employed. Jet probe data collected in 2003 is referenced to Mean Lower Low Water (MLLW); whereas vibracores collected in New River Inlet and the final borrow area design of the New River Inlet channel is referenced to National Geodetic Vertical Datum 1929 (NGVD 29). Offshore vibracores and the offshore borrow area for North Topsail Beach are referenced to North American Vertical Datum 1988 (NAVD 88). The table below shows the differences between these different datum in feet:

ELEVATION CONVERSION TABLE		
MLLW	NGVD 29	NAVD 88
5.0	3.4	2.5
2.5	1.0	<b>0.0</b>
1.6	<b>0.0</b>	-1.0
<b>0.0</b>	-1.6	-2.5
-5.0	-6.6	-7.5
-15.4 *	-17.0 *	-18.0 *

\* Depth of New River Inlet Channel

**1) 2003, 2006, and 2008 Borrow Area Composite Summary Tables for New River Inlet**  
A series of summary tables are presented in this appendix. These tables are used to calculate and summarize composite data. Composite calculations are based on select beach quality samples from the 2003, 2006, and 2008 CPE-NC vibracores, presented in appendices 5, 6, 7, 10, 11, 12, 14, 15, and 16. An average of beach quality layers, weighted by effective length, was calculated for each vibracore, producing the vibracore composite. The vibracore composites were averaged and weighted by effective length to calculate the borrow area composite.

Four (4) table types were produced to display this data. The *Composite Summary* table is a summary of key grain size data for all of the composites. The *Composite Data* table shows the composite data for the borrow area and the supporting composite vibracore data used to calculate the borrow area composite. The *Cumulative Percents and Computed Composite Distribution* table shows the weighted average percent retained on all sieves for the individual samples used to create vibracore composites. The *Percentage of Material by Sediment Grain Size Category* table shows the percent of material in each of the four (4) grain size categories (fine, sand, granular and gravel) as defined by the North Carolina State Technical Standards outlined in NCAC 07H .0312.

**2) 2003 Jet Probe Logs New River Inlet**

Descriptive logs are presented summarizing each diver-based jet probe. The twenty (20) jet probe logs include a rough description of sediments encountered during each probe ( e.g. clay/silt/sand/shell hash/shell fragments/whole shells), water depth, weather conditions, turbidity during the probes (indicating silt/clay content), and laboratory or visual analysis of top, middle and bottom samples. The symbol, derived from USCS classification, indicates sediment type and is based on diver observations and laboratory analyses of the sediments.

**3) 2003 CPE-NC Individual Jet Probe Granularmetric Reports New River Inlet  
(Digital Copy Only)**

Twenty samples (corresponding to middle portions of each probe) were sieved by CPE-NC using standard mechanical sieving and analysis techniques. Data presented include mean grain size, silt percent, estimated shell percent, sorting and wet/dry Munsell colors.

**4) 2003 CPE-NC Individual Jet Probe Grain Size Distribution Curves/Histograms New River Inlet (Digital Copy Only)**

Grain-size distribution curves and histograms are presented for twenty middle samples from each jet probe

**5) 2003 CPE-NC Vibracore Logs New River Inlet**

A total of 5 vibracores, with corresponding jets, were collected from within the study area. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification (USCS) terminology is used in the core layer descriptions and key grain size information (mean grain size, estimated shell percent, silt content and sorting) for each vibracore sample is presented under the *Remarks* column. Multiple layer intervals are sometimes represented by a single sample. The *Sample Number* column is used to identify the specific sample that represents a specific layer.

**6) 2003 CPE-NC Individual Vibracore Granularmetric Reports New River Inlet  
(Digital Copy Only)**

This appendix contains individual granularmetric reports for each of the twenty-six (26) vibracore samples.

**7) 2003 CPE-NC Individual Vibracore Grain Size Distribution Curves/Histograms New River Inlet (Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the twenty-six (26) vibracore samples.

**8) 2003 CPE-NC Vibracore Photographs New River Inlet**

Vibracores obtained by CPE-NC during this phase of the project were photographed in 2.0 ft intervals. Jetted vibracores were photographed to correspond to the correct depth at which vibracoring began.

**9) 2003 Penetrometer Records New River Inlet (Digital Copy Only)**

Vibracore penetrometer records were collected by Athena Technologies Inc. during field operations. These records show the speed of penetration for the vibracores, which is needed to

determine refusal. Penetrometer records can also be useful in making estimates of sediment type in the field.

**10) 2006 CPE-NC Vibracore Logs New River Inlet**

A total of 2 vibracores were collected from within the study area. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification (USCS) terminology is used in the core layer descriptions and key grain size information (mean grain size, estimated shell percent, silt content and sorting) for each vibracore sample is presented under the *Remarks* column. Multiple layer intervals are sometimes represented by a single sample. The *Sample Number* column is used to identify the specific sample that represents a specific layer.

**11) 2006 CPE-NC Individual Vibracore Granularmetric Reports New River Inlet  
(Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the twelve (12) vibracore samples

**12) 2006 CPE-NC Individual Vibracore Grain Size Distribution Curves/Histograms  
New River Inlet (Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the twelve (12) vibracore samples.

**13) 2006 CPE-NC Vibracore Photographs New River Inlet**

Vibracores obtained by CPE-NC during this phase of the project were photographed in 2.0 ft intervals.

**14) 2008 CPE-NC Vibracore Logs New River Inlet**

A total of seven (7) vibracores were collected from within the study area. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification (USCS) terminology is used in the core layer descriptions and key grain size information (mean grain size, estimated shell percent, silt content and sorting) for each vibracore sample is presented under the *Remarks* column. Multiple layer intervals are sometimes represented by a single sample. The *Sample Number* column is used to identify the specific sample that represents a specific layer.

**15) 2008 CPE-NC Individual Vibracore Granularmetric Reports New River Inlet  
(Digital Copy Only)**

This appendix contains individual granularmetric reports for each of the twenty-five (25) vibracore samples.

**16) 2008 CPE-NC Individual Vibracore Grain Size Distribution Curves/Histograms  
New River Inlet (Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the twenty-five (25) vibracore samples.

**17) 2003, 2006, and 2008 Composite Vibracore Granularmetric Reports New River Inlet  
(Digital Copy Only)**

Composite granularmetric reports, corresponding to data presented in the tables in Appendix 1, are included here. Granularmetric reports are presented for the borrow area and each vibracore.

**18) 2003, 2006, and 2008 Composite Vibracore Grain Size Distribution Curves/  
Histograms New River Inlet (Digital Copy Only)**

Composite grain size distribution curves and histograms of the data presented in the Appendix 1 tables are included here. Curves and histograms are presented for the borrow area and each vibracore.

**19) 2005 and 2006 Borrow Area Composite Summary Tables Offshore Borrow Area**

A series of summary tables are presented in this appendix. These tables are used to calculate and summarize composite data. Composite calculations are based on select beach quality samples from the 2005 and 2006 CPE-NC vibracores for the offshore borrow area, presented in appendices 21, 22, 23, 25, 26, and 27. An average of beach quality layers, weighted by effective length, was calculated for each vibracore, producing the vibracore composite. The vibracore composites were averaged and weighted by effective length to calculate the borrow area composite.

Four table types were produced to display this data. The *Composite Summary* table is a summary of key grain size data for all of the composites. The *Composite Data* table shows the composite data for the borrow area and the supporting composite vibracore data used to calculate the borrow area composite. The *Cumulative Percents and Computed Composite Distribution* table shows the weighted average percent retained on all sieves for the individual samples used to create vibracore composites. The *Percentage of Material by Sediment Grain Size Category* table shows the percent of material in each of the four grain size categories (fine, sand, granular and gravel) as defined by the North Carolina State Technical Standards outlined in NCAC 07H .0312.

**20) 2004 CPE-NC Jet Probe Logs Offshore Borrow Area**

A total of fourteen (14) jet probes were collected by Coastal Planning & Engineering during the offshore sand search investigation.

**21) 2005 CPE-NC Vibracore Logs Offshore Borrow Area**

A total of thirty (30) vibracores were collected by CPE-NC during the 2005 offshore sand search investigation. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification terminology is used in the core layer descriptions and key grain size information (mean grain size, fines content and sorting) for each vibracore sample is presented under the *Remarks* column. Multiple layer intervals are sometimes represented by a single sample. The *Sample Number* column is used to identify the specific sample that represents a specific layer.

**22) 2005 CPE-NC Individual Vibracore Granularmetric Reports Offshore Borrow Area  
(Digital Copy Only)**

This appendix contains individual granularmetric reports for each of the one hundred and eleven (111) vibracore samples.

**23) 2005 CPE-NC Individual Vibracore Grain Size Distribution Curves/Histograms Offshore Borrow Area (Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the one hundred and eleven (111) vibracore samples.

**24) 2005 CPE-NC Vibracore Photographs Offshore Borrow Area**

Vibracores collected in 2005 were photographed in 2.0 ft intervals.

**25) 2006 CPE-NC Vibracore Logs Offshore Borrow Area**

A total of eighteen (18) vibracores were collected by CPE-NC during the 2006 offshore sand search investigation. Laboratory and descriptive information for each vibracore is presented on the log sheets. Unified Soils Classification terminology is used in the core layer descriptions and key grain size information (mean grain size, fines content and sorting) for each vibracore sample is presented under the *Remarks* column. Multiple layer intervals are sometimes represented by a single sample. The *Sample Number* column is used to identify the specific sample that represents a specific layer.

**26) 2006 CPE-NC Individual Vibracore Granularmetric Reports Offshore Borrow Area (Digital Copy Only)**

This appendix contains individual granularmetric reports for each of the ninety-eight (98) vibracore samples.

**27) 2006 CPE-NC Individual Vibracore Grain Size Distribution Curves/Histograms Offshore Borrow Area (Digital Copy Only)**

This appendix contains individual gradation grain size distribution curves/histograms for each of the ninety-eight (98) vibracore samples.

**28) 2006 CPE-NC Vibracore Photographs Offshore Borrow Area**

Vibracores collected in 2006 were photographed in 2.0 ft intervals

**29) 2005 and 2006 Composite Vibracore Granularmetric Reports Offshore Borrow Area (Digital Copy Only)**

Composite granularmetric reports, corresponding to data presented in the tables in Appendix 19, are included here. Granularmetric reports are presented for the borrow area and each vibracore.

**30) 2005 and 2006 Composite Vibracore Grain Size Distribution Curves/Histograms Offshore Borrow Area (Digital Copy Only)**

Composite grain size distribution curves and histograms of the data presented in the Appendix 19 tables are included here. Curves and histograms are presented for the borrow area and each vibracore.

**31) 2005 Seismic Records Offshore Borrow Area (Digital Copy Only)**

This appendix includes seismic records collected in the study area containing files in HTML format.

**32) 2006 Beach Composite Summary Tables**

A series of summary tables are presented in this appendix. These tables are used to calculate and summarize composite data. Composite calculations are based on the mechanically analyzed samples presented in appendices 33 and 34. Information from the USACE was also used in the composite calculations.

Five (5) table types were produced to display this data. The *Profile Line Summary* table is a summary of grain size data for all of the profile line composites. The *Profile Line Data* table shows the composite cumulative percent retained for the line and the total beach composites. The *Profile Line Composites* table shows the supporting individual sieve data used in the calculation of each line composite. The *Elevation Composites* table shows the supporting individual sieve data used in the calculation of composites at each sample elevation. The *Percentage of Material by Sediment Grain Size Category* table shows the percent of material in each of the four grain size categories (fine, sand, granular and gravel) as defined by the North Carolina State Technical Standards outlined in NCAC 07H .0312.

**33) 2006 CPE-NC Individual Beach Granularmetric Reports (Digital Copy Only)**

Individual granularmetric reports, corresponding to data presented in the tables in Appendix 32, are included here. Granularmetric reports are presented for TB13 +5.0 and Dune, TB14 +3.0 and Dune, TB15 +3.0 and Dune, TB16 +4.0 and Dune, TB17 +3.0 and Dune, TB18 +4.1 and Dune, TB19 +4.5 and Dune, TB20 +3.0 and Dune, TB21 +3.0 and Dune, TB22 +3.0 and Dune, TB23 +3.0 and Dune, and TB24 Base Scarp and Dune.

**34) 2006 CPE-NC Individual Beach Grain Size Distribution Curves/Histograms (Digital Copy Only)**

Individual grain size distribution curves and histograms of the data presented in the Appendix 32 are included here. Curves/histograms are presented for TB13 +5.0 and Dune, TB14 +3.0 and Dune, TB15 +3.0 and Dune, TB16 +4.0 and Dune, TB17 +3.0 and Dune, TB18 +4.1 and Dune, TB19 +4.5 and Dune, TB20 +3.0 and Dune, TB21 +3.0 and Dune, TB22 +3.0 and Dune, TB23 +3.0 and Dune, and TB24 Base Scarp and Dune.

**35) 2006 Composite Beach Granularmetric Reports (Digital Copy Only)**

Composite granularmetric reports, corresponding to data presented in the tables in Appendix 32, are included here. Granularmetric reports are presented for the total beach, each range monument line and each elevation.

**36) 2006 Composite Beach Grain Size Distribution Curves/Histograms (Digital Copy Only)**

Composite grain size distribution curves and histograms of the data presented in the Appendix 32 are included here. Curves/histograms are presented for the total beach, each range monument line and each elevation.

## **APPENDIX 1**

### **2003, 2006, AND 2008 BORROW AREA COMPOSITE SUMMARY TABLES FOR NEW RIVER INLET**

**COMPOSITE SUMMARY TABLE**  
**NEW RIVER INLET VIBRACORES**

VIBRACORE	EFFECTIVE LENGTH (FT)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT
NRVC-03-04 Composite	10.10	0.33	1.62	0.99	0.72
NTVC-06-19 Composite	12.20	0.29	1.80	1.31	1.64
NTVC-06-20 Composite	8.10	0.33	1.60	1.40	1.90
NTVC-08-01 Composite	2.50	1.36	0.44	1.25	0.88
NTVC-08-02 Composite	4.80	1.10	0.14	1.77	1.43
NTVC-08-03 Composite	4.60	0.20	2.34	0.97	1.80
NTVC-08-04 Composite	2.40	0.34	1.55	1.45	1.51
NTVC-08-05 Composite	0.00	-	-	-	-
NTVC-08-06 Composite	12.00	0.36	1.49	1.20	1.46
NTVC-08-07 Composite	8.30	0.60	0.73	1.60	2.21
INLET COMPOSITE	65.00	0.39	1.35	1.49	1.53

**COMPOSITE DATA TABLE**  
**NEW RIVER INLET**

SAMPLE I. D.	EFFECTIVE LENGTH (FT)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																				
						-4.25	-4.0	-3.5	-3.0	-2.5	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	FINES PAN
NRVC-03-04 Composite	10.1	0.33	1.62	0.99	0.72	0.00	0.00	0.21	0.42	0.63	0.83	1.10	2.27	3.47	5.29	7.43	10.46	15.55	26.23	59.77	91.66	98.66	99.18	99.26	99.28	99.98
NTVC-06-19 Composite	12.2	0.29	1.80	1.31	1.64	0.00	0.00	0.00	1.66	2.91	3.19	3.87	4.87	5.93	7.34	8.90	11.10	13.78	19.99	40.23	73.21	92.96	97.67	98.19	98.36	99.95
NTVC-06-20 Composite	8.1	0.33	1.60	1.40	1.90	0.00	0.00	0.00	0.93	1.81	2.08	2.33	3.28	5.02	7.93	12.01	19.10	29.26	40.68	50.12	65.35	86.96	96.27	97.62	98.10	99.96
NTVC-08-01 Composite	2.5	1.36	0.44	1.25	0.88	0.00	0.00	0.00	2.85	7.42	9.06	11.23	19.89	31.33	44.96	60.46	74.27	88.68	95.50	97.50	98.53	98.95	99.00	99.02	99.12	99.97
NTVC-08-02 Composite	4.8	1.10	0.14	1.77	1.43	0.00	0.00	2.40	10.27	14.63	16.30	19.09	24.09	30.36	37.33	44.68	54.28	67.95	80.65	89.61	95.94	98.25	98.51	98.55	98.57	99.87
NTVC-08-03 Composite	4.6	0.20	2.34	0.97	1.80	0.00	0.00	0.00	0.21	0.43	0.58	0.61	0.98	1.44	2.13	3.02	4.56	7.62	13.63	24.23	45.40	78.81	93.75	97.18	98.20	100.00
NTVC-08-04 Composite	2.4	0.34	1.55	1.45	1.51	0.00	0.00	0.00	1.13	2.66	2.81	3.39	5.59	7.89	10.48	13.76	18.85	26.59	35.18	46.85	70.29	92.26	97.57	98.26	98.49	99.84
NTVC-08-05 Composite	0.0	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NTVC-08-06 Composite	12.0	0.36	1.49	1.20	1.46	0.00	0.00	0.22	0.77	1.32	1.54	1.97	2.77	3.98	5.88	9.15	14.63	27.21	44.47	62.56	80.86	92.84	97.29	98.21	98.54	100.00
NTVC-08-07 Composite	8.3	0.60	0.73	1.60	2.21	0.00	0.00	0.81	2.63	3.86	5.26	7.07	11.39	17.02	23.24	29.42	36.93	45.18	54.80	71.57	92.14	97.34	97.70	97.76	97.79	99.95
<b>INLET COMPOSITE</b>	<b>65.00</b>	<b>0.39</b>	<b>1.35</b>	<b>1.49</b>	<b>1.53</b>	<b>0.00</b>	<b>0.00</b>	<b>0.35</b>	<b>1.90</b>	<b>3.10</b>	<b>3.64</b>	<b>4.46</b>	<b>6.46</b>	<b>9.03</b>	<b>12.26</b>	<b>16.11</b>	<b>21.39</b>	<b>29.39</b>	<b>40.00</b>	<b>57.59</b>	<b>79.50</b>	<b>93.23</b>	<b>97.50</b>	<b>98.22</b>	<b>98.47</b>	<b>99.96</b>

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY				
SAMPLE I. D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.0mm)	Granular % (2.0mm-4.76mm)	Gravel % (4.76mm-76mm)
NRVC-03-04#1	0.65	98.28	1.07	0.00
NRVC-03-04#2	0.82	98.16	1.02	0.00
NRVC-03-04#3	0.73	91.07	6.23	1.97
NRVC-03-04A#4	0.89	80.53	11.33	7.25
NRVC-03-04B#5	0.81	87.46	8.21	3.52
NRVC-03-04C#6	1.37	55.65	29.56	13.42
<b>NRVC-03-04 Composite</b>	<b>0.72</b>	<b>95.81</b>	<b>2.64</b>	<b>0.83</b>
NTVC-06-19#1	1.23	98.72	0.05	0.00
NTVC-06-19#2	1.43	98.34	0.23	0.00
NTVC-06-19#3	1.32	61.65	16.80	20.23
NTVC-06-19#4	1.02	98.58	0.26	0.14
NTVC-06-19#5	3.07	96.91	0.02	0.00
<b>NTVC-06-19 Composite</b>	<b>1.64</b>	<b>92.43</b>	<b>2.74</b>	<b>3.19</b>
NTVC-06-20#1	1.39	96.67	0.82	1.12
NTVC-06-20#2	1.37	80.73	11.20	6.70
NTVC-06-20#3	1.43	91.92	6.16	0.49
NTVC-06-20#4	0.90	93.73	2.32	3.05
NTVC-06-20#5	0.98	90.78	6.30	1.94
NTVC-06-20#6	4.22	95.41	0.37	0.00
NTVC-06-20#7	3.40	96.60	0.00	0.00
<b>NTVC-06-20 Composite</b>	<b>1.90</b>	<b>93.08</b>	<b>2.94</b>	<b>2.08</b>
NTVC-08-01#1	0.88	67.79	22.27	9.06
NTVC-08-01#2	44.74	49.08	1.96	4.22
NTVC-08-01#3	5.33	83.92	9.55	1.20
NTVC-08-01#4	10.98	88.83	0.19	0.00
<b>NTVC-08-01 Composite</b>	<b>0.88</b>	<b>67.79</b>	<b>22.27</b>	<b>9.06</b>
NTVC-08-02#1	1.24	63.19	14.85	20.72
NTVC-08-02#2	1.63	73.22	13.27	11.88
<b>NTVC-08-02 Composite</b>	<b>1.43</b>	<b>68.21</b>	<b>14.06</b>	<b>16.30</b>
NTVC-08-03#1	1.08	95.69	1.83	1.40
NTVC-08-03#2	2.30	97.52	0.18	0.00
NTVC-08-03#3	2.55	97.44	0.01	0.00
<b>NTVC-08-03 Composite</b>	<b>1.80</b>	<b>96.76</b>	<b>0.86</b>	<b>0.58</b>
NTVC-08-04#1	1.82	82.81	9.75	5.62
NTVC-08-04#2	1.21	98.39	0.40	0.00
<b>NTVC-08-04 Composite</b>	<b>1.51</b>	<b>90.60</b>	<b>5.08</b>	<b>2.81</b>
NTVC-08-05#1	1.28	97.40	1.03	0.29
NTVC-08-05#2	1.83	98.12	0.05	0.00
NTVC-08-05#3	3.86	95.93	0.21	0.00
<b>NTVC-08-05 Composite</b>	-	-	-	-
NTVC-08-06#1	1.06	98.64	0.30	0.00
NTVC-08-06#2	0.98	84.83	9.66	4.53
NTVC-08-06#3	1.56	94.66	2.63	1.15
NTVC-08-06#4	0.87	96.85	1.29	0.99
NTVC-08-06#5	1.20	98.80	0.00	0.00
NTVC-08-06#6	2.14	95.45	2.23	0.18
NTVC-08-06#7	5.20	89.61	1.57	3.62
<b>NTVC-08-06 Composite</b>	<b>1.46</b>	<b>94.56</b>	<b>2.43</b>	<b>1.54</b>
NTVC-08-07#1	1.15	92.93	5.05	0.87
NTVC-08-07#2	2.48	90.83	5.01	1.68
NTVC-08-07#3	2.60	67.28	20.05	10.07
NTVC-08-07#4	3.32	95.30	1.14	0.24
<b>NTVC-08-07 Composite</b>	<b>2.21</b>	<b>80.77</b>	<b>11.76</b>	<b>5.26</b>
<b>INLET COMPOSITE</b>	<b>1.53</b>	<b>89.44</b>	<b>5.38</b>	<b>3.64</b>

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NEW RIVER INLET VIBRACORES																																
SAMPLE I. D.	ELEVATION NGVD29 (ft)	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																									
							GRAVEL							GRANULAR							SAND							FINES PAN				
NRVC-03-04#1	-7.9	5.1	0.30	1.74	0.69	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	1.07	1.94	3.21	5.28	9.88	20.50	63.24	95.10	98.96	99.29	99.35	99.35	99.97					
NRVC-03-04#2	-9.9	2.6	0.26	1.94	0.71	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	1.02	1.77	2.87	4.53	7.29	15.70	43.09	85.59	98.31	99.11	99.16	99.18	100.00					
NRVC-03-04#3	-11.9	1.7	0.44	1.20	1.36	0.73	0.00	0.00	0.69	1.38	1.68	1.97	2.68	5.18	8.20	13.30	18.60	25.21	33.11	45.45	66.04	88.61	98.17	99.03	99.23	99.27	100.00					
NRVC-03-04#4	-13.9	0.7	0.65	0.63	1.59	0.89	0.00	0.00	1.36	2.72	4.99	7.25	9.42	13.86	18.58	23.26	28.05	34.36	44.92	60.38	81.25	96.58	98.90	99.05	99.10	99.11	99.97					
NRVC-03-04#5	-15.7	0.0	0.48	1.06	1.39	0.81	0.00	0.00	0.00	1.76	3.52	4.74	7.86	11.73	16.03	20.45	26.14	34.46	47.15	72.33	93.45	98.83	99.14	99.17	99.19	100.00						
NRVC-03-04#6	-19.9	0.0	1.72	-0.78	1.30	1.37	0.00	0.00	1.45	2.90	8.16	13.42	18.70	29.38	42.98	58.74	71.58	82.31	90.01	93.59	97.23	98.01	98.41	98.54	98.59	98.63	99.97					
Cut to -16.0 NGVD							<b>10.1</b>	<b>0.33</b>	<b>1.62</b>	<b>0.99</b>	<b>0.72</b>	<b>0.00</b>	<b>0.00</b>	<b>0.21</b>	<b>0.42</b>	<b>0.63</b>	<b>0.83</b>	<b>1.10</b>	<b>2.27</b>	<b>3.47</b>	<b>5.29</b>	<b>7.43</b>	<b>10.46</b>	<b>15.55</b>	<b>26.23</b>	<b>59.77</b>	<b>91.66</b>	<b>98.66</b>	<b>99.18</b>	<b>99.26</b>	<b>99.28</b>	<b>99.98</b>
NTVC-06-19#1	-5.3	2.0	0.21	2.28	0.50	1.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.15	0.25	0.53	1.31	5.36	21.24	68.21	94.53	98.29	98.70	98.77	99.97					
NTVC-06-19#2	-7.3	1.9	0.19	2.40	0.55	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.23	0.49	0.73	1.17	2.08	4.64	12.37	53.95	91.96	98.14	98.51	98.57	100.00					
NTVC-06-19#3	-9.3	1.9	1.24	-0.31	1.90	1.32	0.00	0.00	10.64	18.71	20.23	24.59	30.69	37.03	44.64	52.48	62.64	70.90	77.13	83.46	92.97	97.72	98.56	98.67	98.68	99.96						
NTVC-06-19#4	-12.3	3.6	0.29	1.81	0.60	1.02	0.00	0.00	0.00	0.14	0.14	0.24	0.40	0.89	1.80	3.35	6.63	18.62	61.94	93.46	98.14	98.93	98.96	98.98	99.96							
NTVC-06-19#5	-15.3	2.8	0.18	2.47	0.55	3.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.20	0.40	1.04	3.83	15.44	50.41	82.63	94.70	96.30	96.93	99.89						
Cut to -16.5 NGVD							<b>12.2</b>	<b>0.29</b>	<b>1.80</b>	<b>1.31</b>	<b>1.64</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>1.66</b>	<b>2.91</b>	<b>3.19</b>	<b>3.87</b>	<b>4.87</b>	<b>5.93</b>	<b>7.34</b>	<b>8.90</b>	<b>11.10</b>	<b>13.78</b>	<b>19.99</b>	<b>40.23</b>	<b>73.21</b>	<b>92.96</b>	<b>97.67</b>	<b>98.19</b>	<b>98.36</b>	<b>99.95</b>
NTVC-06-20#1	-9.9	2.2	0.22	2.16	0.97	1.39	0.00	0.00	0.00	1.12	1.12	1.63	1.94	2.45	3.52	5.56	8.86	14.80	26.57	57.90	90.02	98.04	98.48	98.61	99.97							
NTVC-06-20#2	-11.9	1.0	0.87	0.20	1.48	1.37	0.00	0.00	3.32	5.05	6.70	7.72	10.83	17.90	30.03	43.38	58.30	72.32	80.78	84.41	90.24	97.46	98.53	98.61	98.63	99.92						
NTVC-06-20#3	-12.3	0.4	0.26	1.92	1.44	1.43	0.00	0.00	0.00	0.24	0.49	1.55	3.37	6.65	10.69	14.82	19.74	23.14	25.35	26.68	41.82	88.10	98.10	98.52	98.57	99.98						
NTVC-06-20#4	-13.9	2.2	0.55	0.86	1.04	0.90	0.00	0.00	1.93	2.96	3.05	3.28	3.91	5.37	7.54	12.09	24.28	47.17	76.06	93.15	97.78	98.96	99.08	99.10	99.97							
NTVC-06-20#5	-14.9	0.4	0.78	0.36	1.03	0.98	0.00	0.00	0.00	1.29	1.94	2.09	4.22	8.24	17.70	31.45	53.91	75.38	87.90	93.96	96.70	98.63	98.99	99.00	99.02	99.90						
NTVC-06-20#6	-16.9	1.9	0.14	2.79	0.59	4.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.37	0.47	0.55	0.69	1.04	1.87	5.24	21.69	61.29	88.84	93.90	95.78	99.95					
NTVC-06-20#7	-18.9	0.0	0.17	2.57	0.39	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.20	86.16	95.07	96.18	96.60	99.68						
Cut to -17.0 NGVD							<b>8.1</b>	<b>0.33</b>	<b>1.60</b>	<b>1.40</b>	<b>1.90</b>	<b>0.00</b>	<b>0.00</b>	<b>0.93</b>	<b>1.81</b>	<b>2.08</b>	<b>2.33</b>	<b>3.28</b>	<b>5.02</b>	<b>7.93</b>	<b>12.01</b>	<b>19.10</b>	<b>29.26</b>	<b>40.68</b>	<b>50.12</b>	<b>65.35</b>	<b>86.96</b>	<b>96.27</b>	<b>97.62</b>	<b>98.10</b>	<b>99.96</b>	
NTVC-08-01#1	-14.5	2.5	1.36	-0.44	1.25	0.88	0.00	0.00	2.85	7.42	9.06	11.23	19.89	31.33	44.96	60.46	74.27	88.68	95.50	97.50	98.53	98.95	99.00	99.02	99.12	99.97						
NTVC-08-01#2	-16.2	0.0	0.33	1.61	1.85	44.74	0.00	0.00	2.39	3.63	4.22	4.58	5.16	6.18</td																		

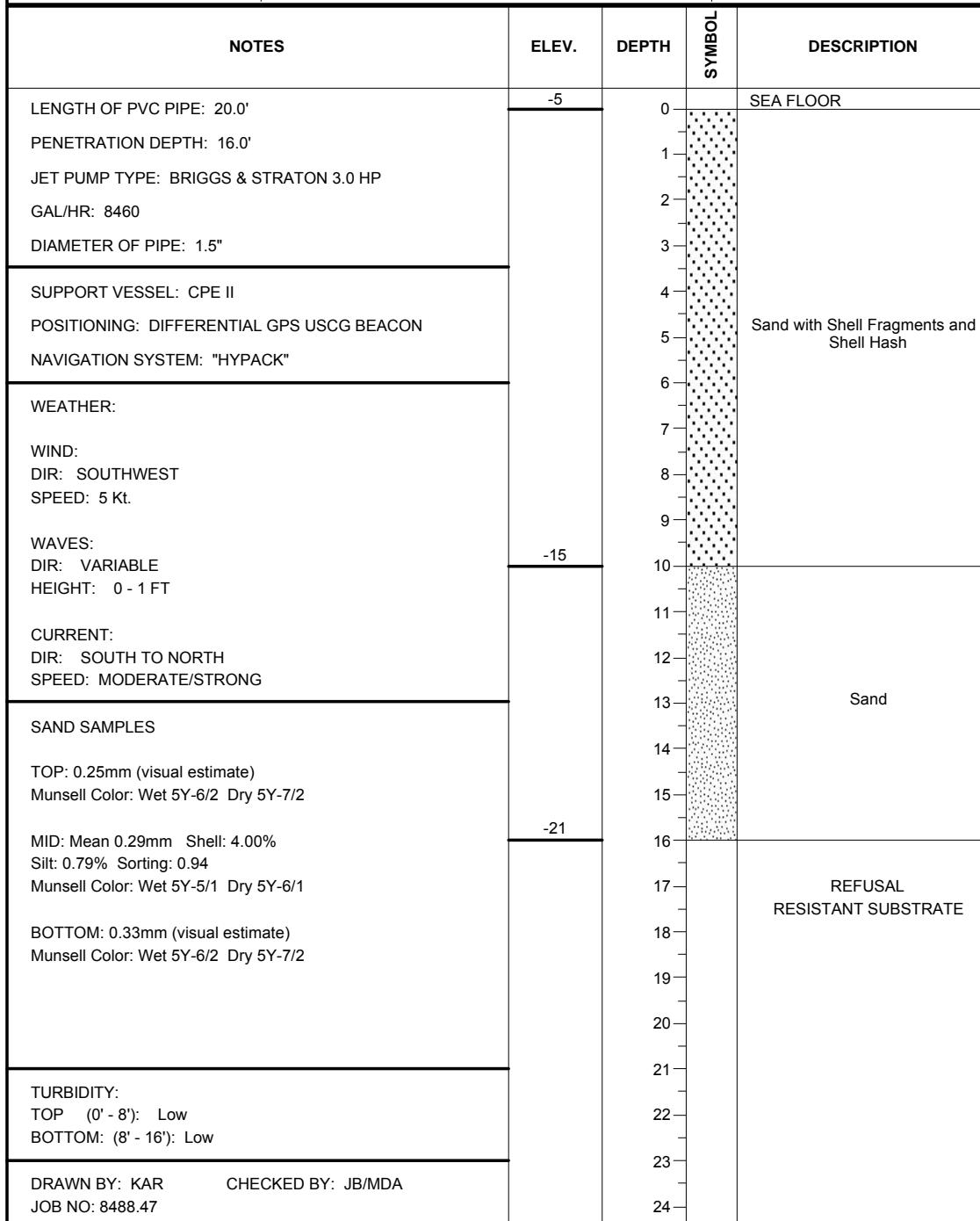
**APPENDIX 2**  
**2003 JET PROBE LOGS NEW RIVER INLET**

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-01**

<b>COORDINATES:</b> <b>N = 291872</b> <b>E = 2499296</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0750 <b>END TIME:</b> 0800	<b>WATER DEPTH:</b> 5.0 FT MLLW <b>TOP DIVER:</b> <b>BOTTOM DIVER:</b> JB
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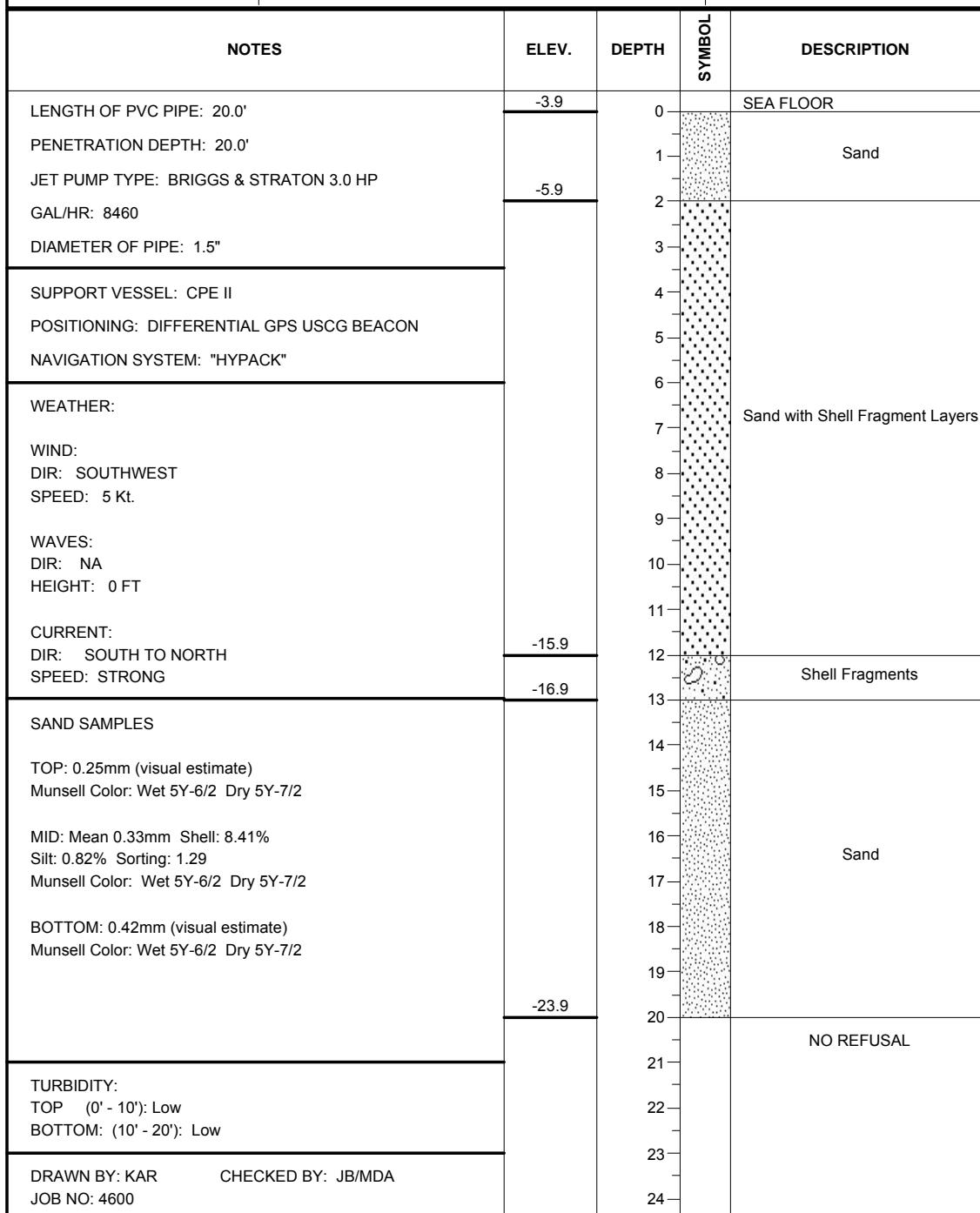


## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-02**

<b>COORDINATES:</b> <b>N</b> = 291564 <b>E</b> = 2500111	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0810 <b>END TIME:</b> 0820	<b>WATER DEPTH:</b> 3.9 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-03**

<b>COORDINATES:</b> <b>N</b> = 290353 <b>E</b> = 2499554	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0830 <b>END TIME:</b> 0835	<b>WATER DEPTH:</b> 2.9 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 19.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-2.9	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1		
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5 Kt.  WAVES: DIR: NA HEIGHT: 0 FT  CURRENT: DIR: SOUTH TO NORTH SPEED: STRONG		2		
SAND SAMPLES  TOP: 0.22mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: 0.21mm Shell: 0.96% Silt: 1.05% Sorting: 0.60 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.25mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2		3		
TURBIDITY: TOP (0' - 9.5'): Low BOTTOM: (9.5' - 19'): Low	-21.9	4		
DRAWN BY: KAR JOB NO: 4600		5		
CHECKED BY: JB/MDA		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		
		16		
		17		
		18		
		19		
		20		REFUSAL RESISTANT SUBSTRATE
		21		
		22		
		23		
		24		

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-04**

<b>COORDINATES:</b> <b>N = 288591</b> <b>E = 2498944</b>	<b>DATE:</b> 07/20/03 <b>START TIME:</b> 1720 <b>END TIME:</b> 1725	<b>WATER DEPTH:</b> 3.6 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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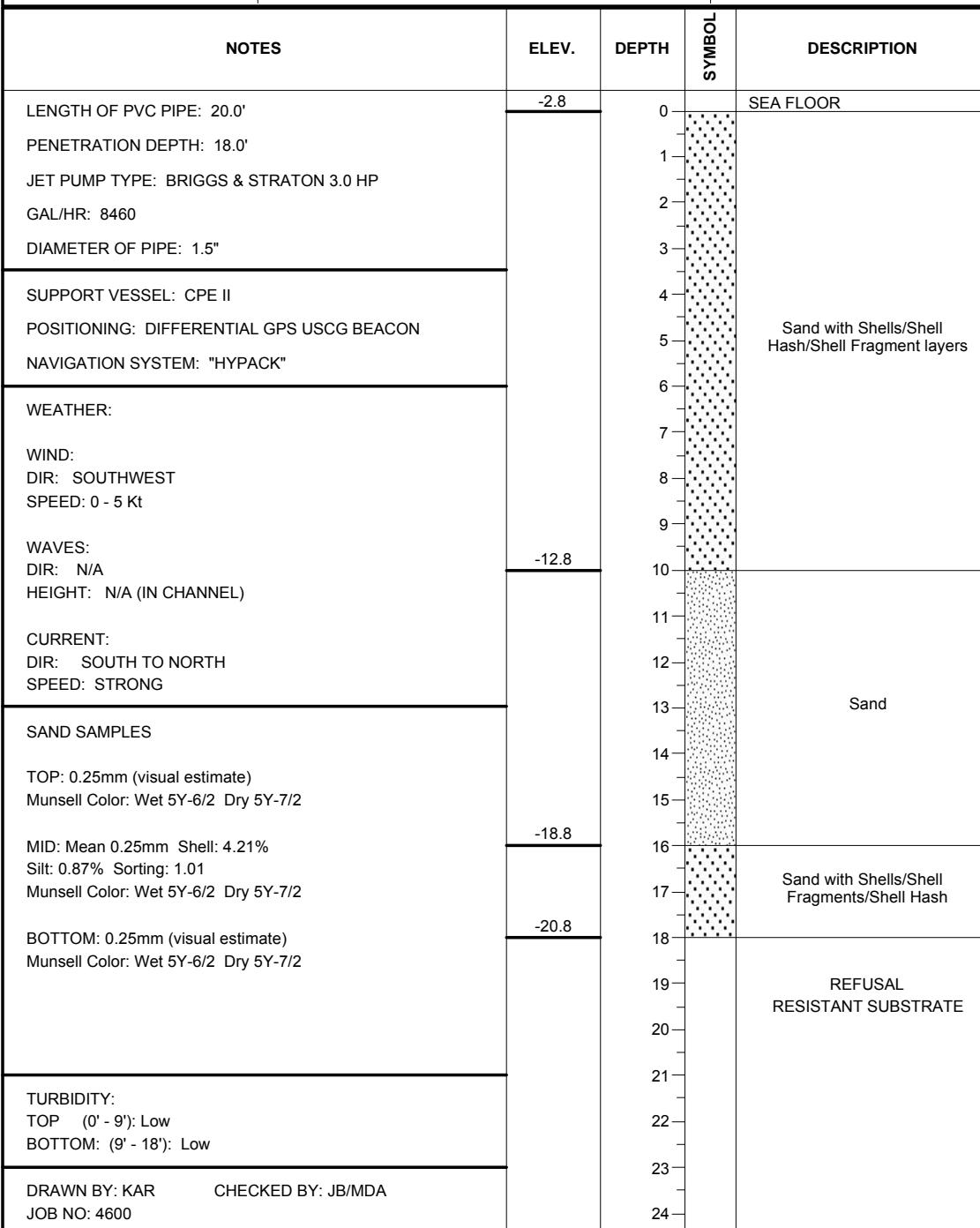
NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 14.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-3.6	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1		
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 0 - 1 FT  CURRENT: DIR: NORTH TO SOUTH SPEED: SLIGHT		2		
SAND SAMPLES  TOP: 1.40mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  MID: Mean 1.42mm Shell: 43.50% Silt: 0.89% Sorting: 1.63 Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  BOTTOM: 1.00mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4	-17.6	3		Shelly Sand
TURBIDITY: TOP (0' - 7'): Low BOTTOM: (7' - 14'): Low		4		
DRAWN BY: KAR JOB NO: 4600		5		
CHECKED BY: JB/MDA		6		
		7		
		8		
		9		
		10		
		11		
		12		
		13		
		14		
		15		REFUSAL RESISTANT SUBSTRATE
		16		
		17		
		18		
		19		
		20		
		21		
		22		
		23		
		24		

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-05**

<b>COORDINATES:</b> <b>N = 289271</b> <b>E = 2499623</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0855 <b>END TIME:</b> 0900	<b>WATER DEPTH:</b> 2.8 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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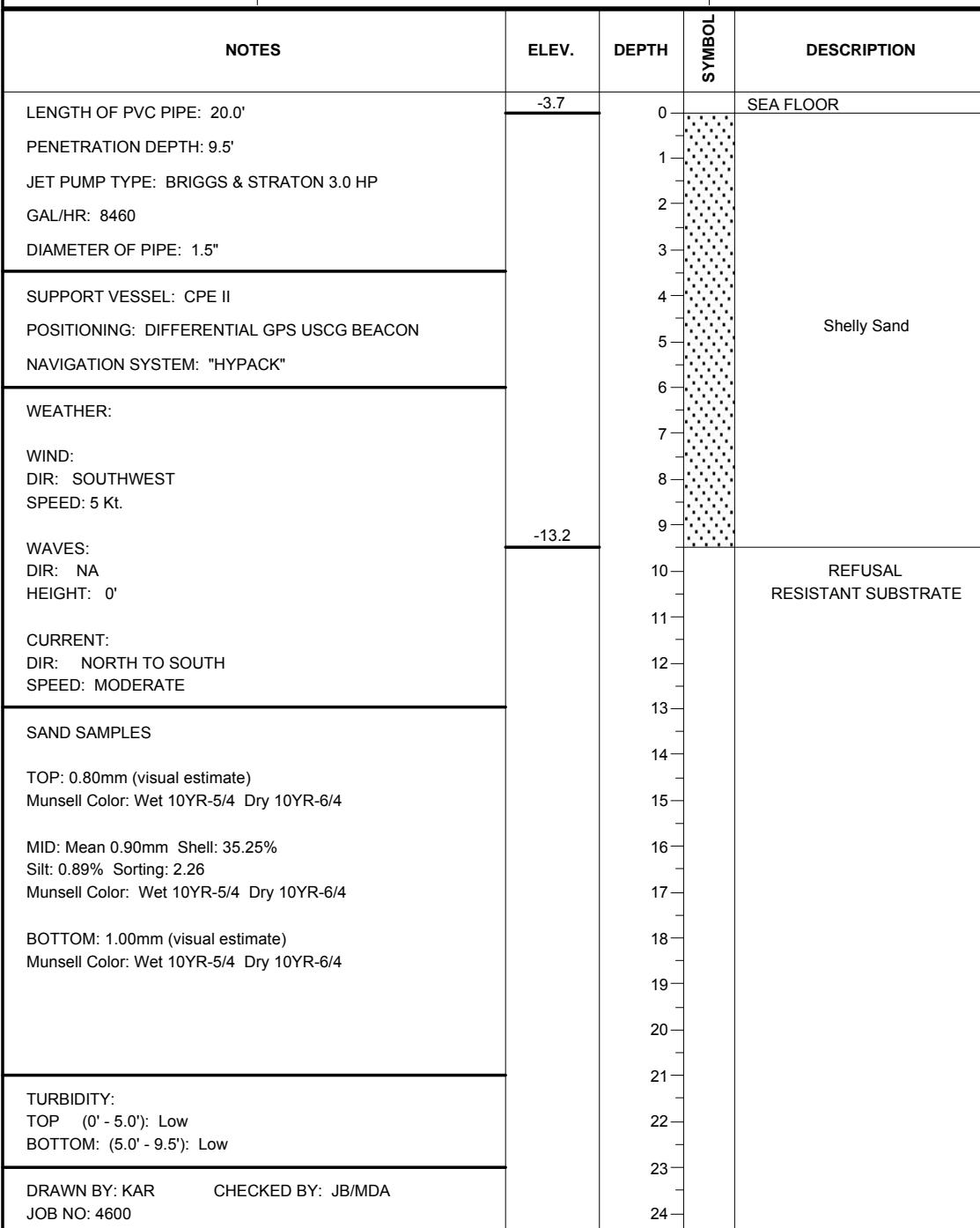


## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-06**

<b>COORDINATES:</b> <b>N = 288663</b> <b>E = 2499516</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0925 <b>END TIME:</b> 0935	<b>WATER DEPTH:</b> 3.7 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-07**

<b>COORDINATES:</b> <b>N = 288446</b> <b>E = 2500192</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 0945 <b>END TIME:</b> 0950	<b>WATER DEPTH:</b> 4.7 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 14.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4.7	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1		
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5 Kt.  WAVES: DIR: NA HEIGHT: 0 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE		2		Sand with Shell Hash/Shell Fragment layers
SAND SAMPLES  TOP: 0.70mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  MID: Mean 0.64mm Shell: 18.30% Silt: 0.48% Sorting: 1.84 Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  BOTTOM: 0.60mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4	-18.7	14		REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 7'): Low BOTTOM: (7' - 14'): Low		15		
DRAWN BY: KAR JOB NO: 4600		16		
CHECKED BY: JB/MDA		17		
		18		
		19		
		20		
		21		
		22		
		23		
		24		

## JET PROBE LOG

**PROJECT: NEW RIVER INLET**

**JET PROBE: NRJP-03-08**

<b>COORDINATES:</b> <b>N</b> = 288418 <b>E</b> = 2501267	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1000 <b>END TIME:</b> 1010	<b>WATER DEPTH:</b> 4.5 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 10.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4.5	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8 9		Sand with Shell Hash/Shell Fragments
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5 Kt.  WAVES: DIR: SOUTHWEST HEIGHT: 1 - 2 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE		-14.5		REFUSAL RESISTANT SUBSTRATE
SAND SAMPLES  TOP: 0.70mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  MID: Mean 0.63mm Shell: 19.48% Silt: 0.69% Sorting: 2.18 Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  BOTTOM: 0.60mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4		10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		
TURBIDITY: TOP (0' - 5'): Low BOTTOM: (5' - 10'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET**

**JET PROBE: NRJP-03-09**

<b>COORDINATES:</b> <b>N = 287803</b> <b>E = 2499817</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1130 <b>END TIME:</b> 1135	<b>WATER DEPTH:</b> 5.3 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> KW
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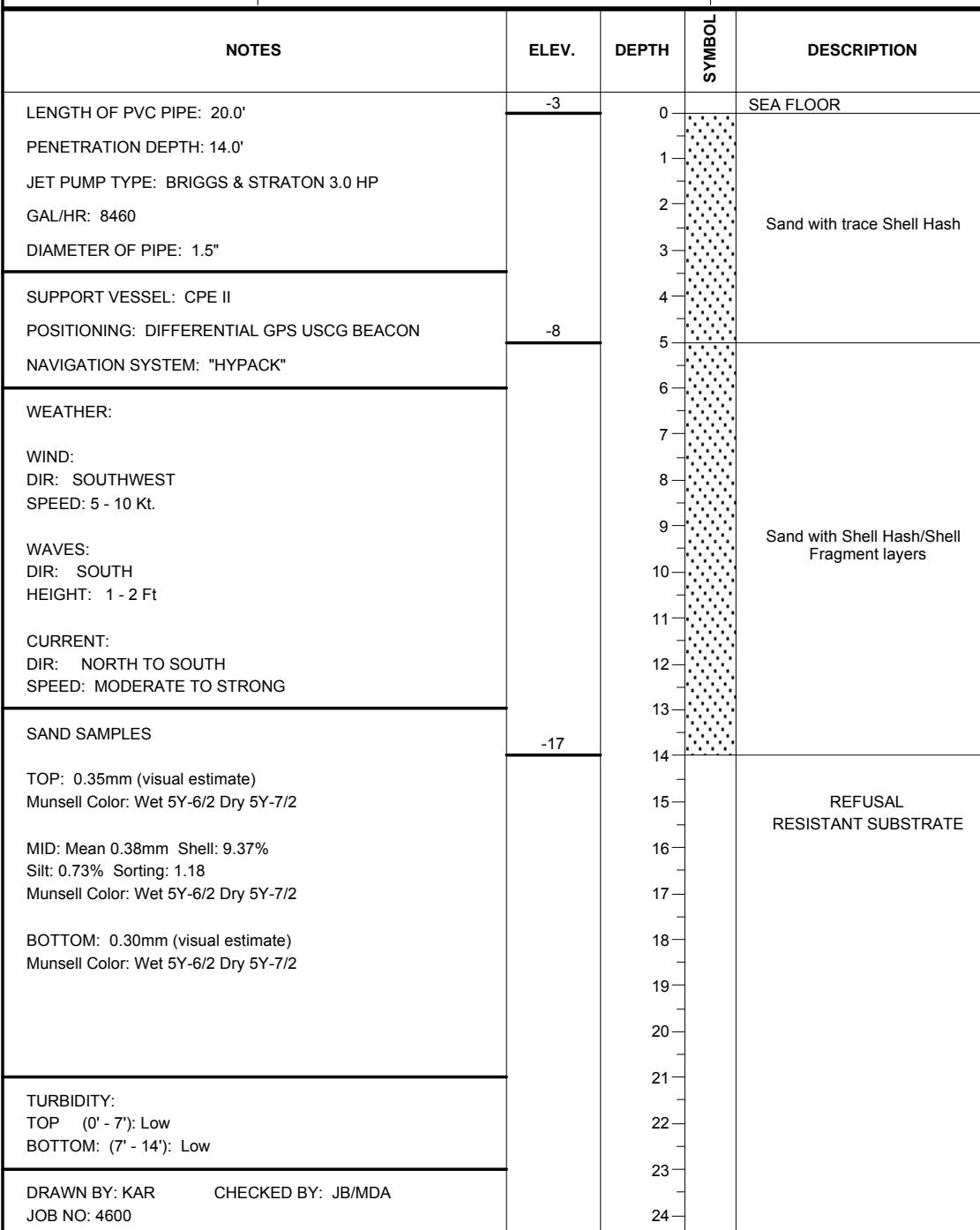
NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 13.5' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-5.3	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8 9 10 11 12 13		Sand with Shell Hash/Shell Fragment layers
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 2 FT  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE		14 15 16 17 18 19 20 21 22 23 24		
SAND SAMPLES  TOP: 0.30mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.43mm Shell: 8.83% Silt: 0.47% Sorting: 1.18 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.35mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2	-18.8			REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 7'): Low BOTTOM: (7' - 13.5'): Low				
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA			

## JET PROBE LOG

**PROJECT: NEW RIVER INLET**

**JET PROBE: NRJP-03-10**

<b>COORDINATES:</b> <b>N = 287062</b> <b>E = 2499334</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1100 <b>END TIME:</b> 1110	<b>WATER DEPTH:</b> 3.0 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> KW
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## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-11**

<b>COORDINATES:</b> <b>N = 287317</b> <b>E = 2500539</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1050 <b>END TIME:</b> 1055	<b>WATER DEPTH:</b> 4.1 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> KW
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 9.5' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4.1	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8 9		Sand with Shell Hash/Shell Fragments
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 2 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE		-13.6		REFUSAL RESISTANT SUBSTRATE
SAND SAMPLES  TOP: 0.60mm (visual estimate) Munsell Color: Wet 10YR-5/4 Dry 10YR-7/3  MID: Mean 0.43mm Shell: 16.72% Silt: 0.71% Sorting: 1.19 Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  BOTTOM: 0.40mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3		10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		
TURBIDITY: TOP (0' - 5'): Low BOTTOM: (5' - 9.5'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-12**

<b>COORDINATES:</b> <b>N = 288026</b> <b>E = 2501267</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1025 <b>END TIME:</b> 1030	<b>WATER DEPTH:</b> 4.6 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 15.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4.6	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15		Sand with Shell Hash and occasional Shell Fragment layer
WEATHER:  WIND: DIR: SOUTHWEST SPEED: 5 Kt.  WAVES: DIR: SOUTHWEST HEIGHT: 1 - 2 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE	-14.6	16 17 18 19 20 21 22 23 24		Sand with Shell Hash
SAND SAMPLES  TOP: 0.22mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.81mm Shell: 38.35% Silt: 0.57% Sorting: 1.58 Munsell Color: Wet 10YR-5/4 Dry 10YR-6/4  BOTTOM: 0.40mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 5Y-7/2	-19.6			REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 7.5'): Low BOTTOM: (7.5' - 15'): Low		21 22 23 24		
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA			

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-13**

<b>COORDINATES:</b> <b>N = 287341</b> <b>E = 2501608</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1205 <b>END TIME:</b> 1215	<b>WATER DEPTH:</b> 4.3 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 12.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4.3	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"	-10.3	1 2 3 4 5 6		Sand with Shell Hash/Shell Fragment layers
WEATHER: WIND: DIR: SOUTHWEST SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-11.3	7 8 9 10 11		Shell Hash/Shell Fragments
SAND SAMPLES  TOP: 0.40mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  MID: Mean 0.39mm Shell: 3.75% Silt: 0.64% Sorting: 1.18 Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  BOTTOM: 0.35mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3	-16.3	12 13 14 15 16 17 18 19 20 21 22 23 24		Sand with Shell Hash/Shell Fragment layers  REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 6'): Low BOTTOM: (6' - 12'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-14**

<b>COORDINATES:</b> <b>N = 286286</b> <b>E = 2501762</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1235 <b>END TIME:</b> 1245	<b>WATER DEPTH:</b> 3.9 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> JB
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 10.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-3.9	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8 9		Sand with trace Shell Hash
WEATHER: WIND: DIR: SOUTHWEST SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-10.9	10		Sand with Shell Hash/Shell Fragment layers
SAND SAMPLES  TOP: 0.25mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.29mm Shell: 13.01% Silt: 0.88% Sorting: 0.94 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.25mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2	-13.9	11 12 13 14 15 16 17 18 19 20 21 22 23 24		REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 5'): Low BOTTOM: (5' - 10'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-15**

<b>COORDINATES:</b> <b>N = 286189</b> <b>E = 2501042</b>	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1300 <b>END TIME:</b> 1310	<b>WATER DEPTH:</b> 5.9 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> KW
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 8.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-5.9	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7 8		Sand with Shell Hash
WEATHER:  WIND: DIR: SOUTH SPEED: 5-10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-13.9	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23		REFUSAL RESISTANT SUBSTRATE
SAND SAMPLES  TOP: 0.35mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  MID: 0.33mm Shell: 20.66% Silt: 0.91% Sorting: 0.81 Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  BOTTOM: 0.35mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3		24		
TURBIDITY: TOP (0' - 4'): Low BOTTOM: (4' - 8'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-16**

<b>COORDINATES:</b> <b>N</b> = 286489 <b>E</b> = 2500226	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1325 <b>END TIME:</b> 1335	<b>WATER DEPTH:</b> 4.0 FT MLLW <b>TOP DIVER:</b> - <b>BOTTOM DIVER:</b> KW
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NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 8.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-4	0		SEA FLOOR
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6 7		Sand with Shell Hash
WEATHER:  WIND: DIR: SOUTH SPEED: 10 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-12	8		REFUSAL RESISTANT SUBSTRATE
SAND SAMPLES  TOP: 0.50mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  MID: Mean 0.36mm Shell: 7.46% Silt: 0.88% Sorting: 1.09 Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3  BOTTOM: 0.35mm (visual estimate) Munsell Color: Wet 10YR-6/3 Dry 10YR-7/3		9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		
TURBIDITY: TOP (0' - 4'): Low BOTTOM: (4' - 8'): Low				
DRAWN BY: KAR JOB NO: 4600				CHECKED BY: JB/MDA

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-17**

<b>COORDINATES:</b> <b>N</b> = 285809 <b>E</b> = 2502679	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1515 <b>END TIME:</b> 1520	<b>WATER DEPTH:</b> 13.2 FT MLLW <b>TOP DIVER:</b> KW <b>BOTTOM DIVER:</b> JB
NOTES	ELEV.	DEPTH
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 11.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-13.2	
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		
WEATHER:  WIND: DIR: SOUTH SPEED: 10-15 Kt.  WAVES: DIR: SOUTH HEIGHT: 2 - 4 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE	-24.2	
SAND SAMPLES  TOP: 0.25mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.26mm Shell: 0.88% Silt: 0.91% Sorting: 0.80 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.22mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2		
TURBIDITY: TOP (0' - 5.5'): Low BOTTOM: (5.5' - 11'): Low		
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA	

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-18**

<b>COORDINATES:</b> <b>N</b> = 285486 <b>E</b> = 2499350	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1355 <b>END TIME:</b> 1405	<b>WATER DEPTH:</b> 9.0 FT MLLW <b>TOP DIVER:</b> KW <b>BOTTOM DIVER:</b> JB
NOTES	ELEV.	DEPTH
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 8.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-9	0 1 2 3 4 5 6 7 8
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		SEA FLOOR Sand with Shell Hash/Shell Fragment layers
WEATHER:  WIND: DIR: SOUTH SPEED: 10-15 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-17	9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
SAND SAMPLES  TOP: 0.20mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.20mm Shell: 2.24% Silt: 0.95% Sorting: 0.93 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.20mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2		REFUSAL RESISTANT SUBSTRATE
TURBIDITY: TOP (0' - 4'): Low BOTTOM: (4' - 8'): Low		
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA	

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-19**

<b>COORDINATES:</b> <b>N</b> = 285268 <b>E</b> = 2500409	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1420 <b>END TIME:</b> 1430	<b>WATER DEPTH:</b> 12.4 FT MLLW <b>TOP DIVER:</b> KW <b>BOTTOM DIVER:</b> JB
NOTES	ELEV.	DEPTH
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 18.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-12.4	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		Sand with trace Shell Hash
WEATHER:  WIND: DIR: SOUTH SPEED: 10-15 Kt.  WAVES: DIR: SOUTH HEIGHT: 1 - 3 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE TO STRONG	-24.4 -25.4	Sand with Shell Fragments
SAND SAMPLES  TOP: 0.20mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  MID: Mean 0.20mm Shell: 1.32% Silt: 1.10% Sorting: 0.84 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.20mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2	-27.4 -30.4	Sand with Shell Hash  Sand with Shell Fragments  REFUSAL RUBBLE
TURBIDITY: TOP (0' - 9'): Low BOTTOM: (9' - 18'): Low		
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA	

## JET PROBE LOG

**PROJECT: NEW RIVER INLET, NC**

**JET PROBE: NRJP-03-20**

<b>COORDINATES:</b> <b>N</b> = 285439 <b>E</b> = 2501622	<b>DATE:</b> 07/21/03 <b>START TIME:</b> 1500 <b>END TIME:</b> 1510	<b>WATER DEPTH:</b> 13.9 FT MLLW <b>TOP DIVER:</b> KW <b>BOTTOM DIVER:</b> JB
NOTES	ELEV.	DEPTH
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 19.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-13.9	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
SUPPORT VESSEL: CPE II POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		Sand with trace Shell Hash
WEATHER:  WIND: DIR: SOUTH SPEED: 10-15 Kt.  WAVES: DIR: SOUTH HEIGHT: 2 - 4 Ft  CURRENT: DIR: NORTH TO SOUTH SPEED: MODERATE		
SAND SAMPLES  TOP: 0.20mm (visual estimate) Munsell Color: Wet 5Y-5/2 Dry 5Y-7/2  MID: Mean 0.19mm Shell: 1.64% Silt: 1.30% Sorting: 0.77 Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2  BOTTOM: 0.20mm (visual estimate) Munsell Color: Wet 5Y-6/2 Dry 5Y-7/2	-32.9	REFUSAL RUBBLE
TURBIDITY: TOP (0' - 9.5') Low BOTTOM: (9.5' - 19') Low		
DRAWN BY: KAR JOB NO: 4600	CHECKED BY: JB/MDA	

### **APPENDIX 3**

**2003 CPE INDIVIDUAL JET PROBE GRANULARMETRIC REPORTS NEW  
RIVER INLET (DIGITAL COPY ONLY)**

#### **APPENDIX 4**

**2003 CPE INDIVIDUAL JET PROBE GRAIN SIZE DISTRIBUTION  
CURVES/HISTOGRAMS NEW RIVER INLET (DIGITAL COPY ONLY)**

**APPENDIX 5**

**2003 CPE VIBRACORE LOGS NEW RIVER INLET**



**Coastal Planning & Engineering**  
**2481 N.W. Boca Raton Blvd.**  
**Boca Raton, Florida 33431**  
Phone # 1-561-391-8102

### Legend for Geotechnical Data

- (SP), (SM), etc. Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs is initially based on visual field examinations and are identified on the core logs under the Classification of Materials Description. Final classifications are based on laboratory sieve analyses and are identified on the core logs in the Legend and under Remarks.
- Silty, shelly, etc. The indicated sediment type is present. The estimated percentage indicated by the Unified Soil Classification System descriptive terms selected to describe the sediment.

Definition of descriptive terms		Grain size terms
Clean	Free of silt or clay	Cobbles – above 3”
Very	To a high degree	Gravel – 3” sieve to # 4 sieve
Slightly	To a small degree	Coarse – 3” sieve to $\frac{3}{4}$ ” sieve
Isolated	Limited occurrence	Fine – $\frac{3}{4}$ ” sieve to # 4 sieve
Occasional	Infrequently present	Sand – # 4 sieve to # 200 sieve
Tight	Dense compacted	Coarse - # 4 sieve to # 10 sieve
		Medium - # 10 sieve to # 40 sieve
		Fine - # 40 sieve to # 200 sieve
		Fine – (silt or clay) < # 200 sieve

Proportional definition of descriptive terms	
<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %
Coarse to fine	All sizes
Coarse to medium	10 % fine
Medium to fine	10 % coarse
Coarse	10 % medium and fine
Medium	10 % coarse and fine
Fine	10 % coarse and medium

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



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### Legend for Geotechnical Data

GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



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### **Legend for Geotechnical Data**

The naming convention used by Coastal Planning and Engineering incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: vibracore (VC)
- Collection year (yy)
- Identification number
- Sample identification in the case of vibracores
- Composite samples are indicated by COMP following the identification number. COMP represents a composite developed to characterize beach compatible material.

#### **Format examples:**

- A) NRVC-03-01
- B) NRVC-03-01 S#2
- C) NTVC-06-19 COMP

Example A is a vibracore number 1, collected in the New River area in the year 2003.

Example B refers to sample number 2 taken from vibracore number 1, which was collected in the New River area in 2003.

Example C illustrates a composite developed to characterize beach compatible material in vibracore 19, collected in North Topsail in 2006. This material is intended for use in beach construction.

No specific format is followed for area name abbreviations; however, the name of the area is always given in the appendix title page where the data is presented.

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499371.77, N(Y) 289072.80			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-01			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/22/03 11:29 12:00			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -6.0 FT NGVD			
9. TOTAL DEPTH OF HOLE 11.2 FT			18. TOTAL CORE RECOVERY FOR BORING 96%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-6	0					
-7	1		SAND, fine to medium grained, quartz, little shell hash, little shell fragments, trace silt, light brownish gray (10YR-6/2), (SW).		1	Sample #1 Depth = 0.6' Mean (mm): 0.58, Phi Sorting: 1.57 Shell: 26.53%, Silt: 0.65% (SW)
	2					
	3		SHELLY SAND, fine to medium grained, trace silt, shell component is shell hash, shell fragments, whole shells up to 1.5", 2" oyster shell fragment @ 1.0', 1.4', and 1.8', 2" shell fragment @ 6.5', light brownish gray (10YR-6/2), (SW).		2	Sample #2 Depth = 4.8' Mean (mm): 0.85, Phi Sorting: 1.62 Shell: 31.38%, Silt: 0.59% (SW)
	4					
-13	7		SAND, fine to medium grained, quartz, little shell hash, little shell fragments up to 1.0", trace silt, 3.0" oyster shell from 7.1'-7.4', light brownish gray (10YR-6/2), (SW).		3	Sample #3 Depth = 7.9' Mean (mm): 0.46, Phi Sorting: 1.44 Shell: 15.79%, Silt: 0.87% (SW)
	8					
-14.4	9		SAND, fine to medium grained, quartz, some shell hash, little shell fragments up to 1.0", trace silt, fossiliferous limestone from 10.1' to 10.5', light brownish gray (10 YR-6/2), (SW).		4	Sample #4 Depth = 9.4' Mean (mm): 0.80, Phi Sorting: 2.04 Shell: 30.98%, Silt: 0.91% (SW)
	10					
-16.7	11		NO RECOVERY			
	12					
-17.2	13		End of Boring			
	14					
	15					
	16					
	17		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	18					
	19					
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-01		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499326.99, N(Y) 289012.18			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-01A			13. TOT NO. OF OVERTBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/23/03 11:09 11:12			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -6.0 FT NGVD			
9. TOTAL DEPTH OF HOLE 17 FT			18. TOTAL CORE RECOVERY FOR BORING 94%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-6	0					
	1					
	2					
	3					
	4					
	5		JETTED TO 10.0'			
	6					
	7					
	8					
	9					
	10					
	11					
	12		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments, trace silt, light olive gray (5Y-6/2), (SW).		5	Sample #5 Depth = 12.0' Mean (mm): 0.39, Phi Sorting: 1.54 Shell: 7.87%, Silt: 0.77% (SW)
	13					
	14		SAND, fine to medium grained, quartz, little shell hash, little shell fragments, trace silt, trace well rounded coarse sand/fine gravel sized quartz, light olive gray, (5Y-6/2), (SW)		6	Sample #6 Depth = 13.5' Mean (mm): 0.93, Phi Sorting: 1.88 Shell: 14.76%, Silt: 0.62% (SW)
	15					
	16		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments, trace silt, light olive gray, (5Y-6/2), (SW).		5	
	17		NO RECOVERY			
	18		End of Boring			
	19		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-01A		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499616.86, N(Y) 287961.17			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-02			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/23/03 08:40 08:58			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -7.6 FT NGVD			
9. TOTAL DEPTH OF HOLE 8.5 FT			18. TOTAL CORE RECOVERY FOR BORING 89%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-7.6	0					
	1		SAND, fine to medium grained, quartz, trace shell hash, trace shell fragments up to 1.0", trace silt, light olive gray (5Y-6/2), (SP).		1	Sample #1 Depth = 1.5' Mean (mm): 0.28, Phi Sorting: 0.78 Shell: 4.22%, Silt: 0.68% (SP)
	2					
-10	3		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SW).		2	Sample #2 Depth = 4.0' Mean (mm): 0.41, Phi Sorting: 1.38 Shell: 12.05%, Silt: 0.86% (SW)
	4					
-12.3	5		SHELLY SAND, shell component is shell hash and shell fragments up to 1.5", gray (5Y-5/1), (GW).		3	Sample #3 Depth = 5.6' Mean (mm): 1.22, Phi Sorting: 1.98 Shell: 23.8%, Silt: 1.12% (SW)
	6					
-13.6	6		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments up to 1.0", trace silt, gray (5Y-5/1), (SW).		4	Sample #4 Depth = 6.5' Mean (mm): 0.42, Phi Sorting: 1.31 Shell: 12.07%, Silt: 0.85% (SW)
	7					
-15.2	8		NO RECOVERY			
	9		End of Boring			
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	19					
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-02		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499616.86, N(Y) 287961.17			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-02A			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/23/03 09:30 09:37			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -7.6 FT NGVD			
9. TOTAL DEPTH OF HOLE 13 FT			18. TOTAL CORE RECOVERY FOR BORING 58%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-7.6	0					
	1					
	2					
	3		JETTED TO 6.5'			
	4					
	5					
	6					
-14.1	7		SAND, medium grained, quartz, some shell hash, trace shell fragments up to 1.0", trace silt, gray (5Y-5/1), (SW).	5		Sample #5 Depth = 7.0' Mean (mm): 0.75, Phi Sorting: 1.78 Shell: 22.55%, Silt: 0.79% (SW)
-15.1	8		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments up to 1.5", trace silt, gray (5Y-5/1), (SW).	2s#2		
-16	9		SHELLY SAND, shell component is shell hash and little shell fragments up to 1.0", trace silt, trace well rounded coarse sand/fine gravel sized quartz, 1.5" oyster shell fragment at 10.1", 1" sandstone clast at base, pale brown (10YR-6/3), (SW).	6		Sample #6 Depth = 9.5' Mean (mm): 1.61, Phi Sorting: 1.98 Shell: 23.79%, Silt: 2.86% (SW)
-17.9	10					
	11		NO RECOVERY			
-20.6	12					
	13		End of Boring			
	14					
	15					
	16					
	17					
	18		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	19					
	20					
			PROJECT: NEW RIVER INLET	HOLE NUMBER: NRVC-03-02A		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499616.86, N(Y) 287961.17			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-02B			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/23/03 10:11 10:16			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -7.6 FT NGVD			
9. TOTAL DEPTH OF HOLE 13 FT			18. TOTAL CORE RECOVERY FOR BORING 71%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-7.6	0					
	1					
	2					
	3					
	4					
	5		JETTED TO 10.0'			
	6					
	7					
	8					
	9					
	10					
-17.6	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
			PROJECT: NEW RIVER INLET	HOLE NUMBER: NRVC-03-02B		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2500294.59, N(Y) 287372.84			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-03			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/22/03 07:20			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -6.1 FT NGVD			
9. TOTAL DEPTH OF HOLE 8.6 FT			18. TOTAL CORE RECOVERY FOR BORING 83%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-6.1	0					
-6.1	1					
-6.1	2		SAND, fine to medium grained, quartz, trace shell hash, trace shell fragments, trace silt, light olive gray (5Y-6/2), (SW).		1	Sample #1 Depth = 2.0' Mean (mm): 0.34, Phi Sorting: 0.97 Shell: 3.79%, Silt: 0.72% (SW)
-9.5	3					
-9.5	4					
-9.5	5		SAND, fine grained, quartz, trace shell hash, trace silt, shell fragments embedded in shell hash from 6.2' to 6.4', sand coarsens near the base, light olive gray (5Y-6/2), (SP).		2	Sample #2 Depth = 5.3' Mean (mm): 0.24, Phi Sorting: 0.84 Shell: 4.47%, Silt: 1.07% (SP)
-13.2	6					
-13.2	7					
-14.7	8		NO RECOVERY			
-14.7	9		End of Boring			
-14.7	10					
-14.7	11					
-14.7	12					
-14.7	13					
-14.7	14					
-14.7	15					
-14.7	16					
-14.7	17					
-14.7	18		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
-14.7	19					
-14.7	20					
			PROJECT: NEW RIVER INLET	HOLE NUMBER: NRVC-03-03		

DRILLING LOG		DIVISION:	INSTALLATION:		SHEET 1 of 1	
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2500294.59, N(Y) 287372.84			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-03A			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started 7/22/03 08:12 Completed			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -6.1 FT NGVD			
9. TOTAL DEPTH OF HOLE 11.5 FT			18. TOTAL CORE RECOVERY FOR BORING 78%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-6.1	0					
	1					
	2					
	3		JETTED TO 6.5'			
	4					
	5					
	6					
-12.6	7		SAND, fine to medium grained, quartz, trace shell hash, trace silt, light olive gray (5Y-6/2), (SW).		3	Sample #3 Depth = 7.0' Mean (mm): 0.32, Phi Sorting: 0.98 Shell: 3.15%, Silt: 0.65% (SW)
-14.4	8					
-15.4	9		SAND, fine to medium grained, quartz, little shell hash, little shell fragments up to 1", trace well rounded coarse sand to fine gravel sized quartz, trace silt, light olive gray (5Y-6/2), (SW).		4	Sample #4 Depth = 8.6' Mean (mm): 0.77, Phi Sorting: 2.10 Shell: 24.25%, Silt: 0.63% (SW)
-16.5	10					
-17.6	11		SAND, fine to medium grained, quartz, little shell hash, trace silt, 0.5" well rounded fine gravel quartz at 9.4", light olive gray (5Y-6/2), (SW).		3	
	12		NO RECOVERY			
	13					
	14					
	15					
	16					
	17					
	18		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	19					
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-03A		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2500285.05, N(Y) 287363.64			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-03B			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/22/03 07:30 07:40			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -6.1 FT NGVD			
9. TOTAL DEPTH OF HOLE 16 FT			18. TOTAL CORE RECOVERY FOR BORING 85%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-6.1	0					
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11					
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
JETTED TO 9.5'						
SHELLY SAND, shell component is predominantly shell hash, little shell fragments up to 1.0", trace silt, trace well rounded coarse sand to fine gravel sized quartz, light olive gray (5Y-6/2), (SW).				5	Sample #5 Depth = 10.0' Mean (mm): 1.16, Phi Sorting: 1.84 Shell: 33.53%, Silt: 1.31% (SW)	
SAND, medium grained, quartz, some shell hash, trace silt, trace shell fragments up to 1.5", trace silt, trace well rounded coarse sand to fine gravel sized quartz, light olive gray (5Y-6/2), (SW).				6	Sample #6 Depth = 11.6' Mean (mm): 0.91, Phi Sorting: 1.64 Shell: 24.88%, Silt: 1.83% (SW)	
SHELLY SAND, shell component is predominantly shell hash, little shell fragments up to 1.0", trace silt, trace well rounded coarse sand/fine gravel sized quartz, trace clay and organics from 12.8'-13.0', 1.5" shelly conglomerate at base, shell hash component increases near base, light olive gray (5Y-6/2), (SW).				5		
NO RECOVERY						
End of Boring						
Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.						
				PROJECT: NEW RIVER INLET		HOLE NUMBER: NRVC-03-03B

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499807.45, N(Y) 286720.38			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-04			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/24/03 08:45 08:50			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -5.9 FT NGVD			
9. TOTAL DEPTH OF HOLE 9.0 FT			18. TOTAL CORE RECOVERY FOR BORING 91%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-5.9	0				1	Sample #1 Depth = 2.0' Mean (mm): 0.30, Phi Sorting: 0.72 Shell: 5.03%, Silt: 0.65% (SP)
	1				2	Sample #2 Depth = 4.0' Mean (mm): 0.26, Phi Sorting: 0.76 Shell: 2.89%, Silt: 0.82% (SP)
	2				3	Sample #3 Depth = 6.0' Mean (mm): 0.46, Phi Sorting: 1.60 Shell: 11.75%, Silt: 0.73% (SW)
-11.5	6		SAND, medium grained, quartz, little shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SW).			
-12.7	7		SAND, fine to medium grained, quartz, trace shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SP).		1	
-13.4	8		SAND, medium grained, quartz, little shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SW).		3	
-13.9	9		SAND, fine to medium grained, quartz, trace shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SP).			
-14.9	10		SAND, medium grained, quartz, little shell hash, trace shell fragments up to 0.5", trace silt, light olive gray (5Y-6/2), (SW).			
	11		NO RECOVERY			
	12		End of Boring			
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499807.45, N(Y) 286720.38			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number)  NRVC-03-04A			13. TOT NO. OF OVERTBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/24/03 09:15 09:35			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -5.9 FT NGVD			
9. TOTAL DEPTH OF HOLE 10.6 FT			18. TOTAL CORE RECOVERY FOR BORING 91%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-5.9	0					
	1					
	2					
	3					
	4		JETTED TO 7.1'			
	5					
	6					
	7					
-13	7					
	8					
	9					
	10					
-14.8	7		SAND, medium grained, quartz, little shell hash, trace shell fragments up to 1.0", little silt, trace well rounded coarse sand/fine gravel sized quartz, light olive gray (5Y-6/2), (SW).	4		Sample #4 Depth = 8.0' Mean (mm): 0.76, Phi Sorting: 2.06 Shell: 6.86%, Silt: 0.89% (SW)
	8					
	9					
	10					
-16.2	7					
-16.5	7		NO RECOVERY	4s#1		
	8					
	9					
	10					
	11		End of Boring			
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-04A		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499807.45, N(Y) 286720.38			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-04B			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/24/03 10:06 10:10			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -5.9 FT NGVD			
9. TOTAL DEPTH OF HOLE 12.7 FT			18. TOTAL CORE RECOVERY FOR BORING 53%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-5.9	0					
	1					
	2					
	3					
	4					
	5		JETTED TO 9.5'			
	6					
	7					
	8					
	9					
	10		SAND, medium grained, quartz, little shell hash, little shell fragments up to 1.0", trace silt, light olive gray (5Y-6/2), (SW). medium grained, quartz, little shell hash, trace shell fragments up to 1.0", trace silt, light olive gray (5Y-6/2), (SW).	5		Sample #5 Depth = 9.8' Mean (mm): 0.53, Phi Sorting: 1.69 Shell: 9.24%, Silt: 0.81% (SW)
	11		CLAY, 1" layer of sandy shell hash at base, dark gray (5Y-4/1), (CL).	4a s#4		
	12		NO RECOVERY			
	13		End of Boring			
	14					
	15					
	16					
	17					
	18					
	19		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	20					
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-04B		

DRILLING LOG		DIVISION:	INSTALLATION:			SHEET 1 of 1
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2499807.45, N(Y) 286720.38			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-04C			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started Completed 7/24/03 10:55 11:06			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -5.9 FT NGVD			
9. TOTAL DEPTH OF HOLE 18.5 FT			18. TOTAL CORE RECOVERY FOR BORING 81%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-5.9	0					
	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					
	11		JETTED TO 11'			
	12					
-16.9	11		SAND, medium grained, quartz, little shell hash, little shell fragments up to 1.0", trace silt, 1.0" limestone clast at 11.7', light olive gray (5Y-6/2), (SW).		4b s#5	
-17.9	12					
	13					
	14					
	15					
	16					
-21.9	11		SHELLY SAND, shell component is predominantly shell hash, little shell fragments up to 1.0", trace silt, trace well rounded coarse sand to fine gravel sized quartz, 1.0" well rounded coarse gravel quartz at 15.2', light yellowish brown (10YR-6/4), (SW).		6	Sample #6 Depth = 14' Mean (mm): 1.76, Phi Sorting: 1.76 Shell: 39.52%, Silt: 1.37% (SW)
-23	16					
	17					
	18					
	19		NO RECOVERY			
	20		Note: End of Boring 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
PROJECT: NEW RIVER INLET				HOLE NUMBER: NRVC-03-04C		

DRILLING LOG		DIVISION:	INSTALLATION:		SHEET 1 of 1	
1. PROJECT NEW RIVER INLET			10. SIZE AND TYPE OF BIT 4"			
2. LOCATION (Coordinates or Station) E(X) 2500855.91, N(Y) 285568.09			11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
3. DRILLING AGENCY: ATHENA Technologies			12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) NRVC-03-05			13. TOT NO. OF OVERBURDEN SAMPLES TAKEN			
5. NAME OF DRILLER Walter J. Sexton			14. TOTAL NO. OF CORE BOXES			
6. DIRECTION OF HOLE VERTICAL			15. ELEVATION GROUND WATER			
7. THICKNESS OF BURDEN			16. DATE HOLE Started 7/25/03 06:55 Completed 07:00			
8. DEPTH DRILLED INTO ROCK			17. ELEVATION TOP OF HOLE -12.9 FT NGVD			
9. TOTAL DEPTH OF HOLE 6.0 FT			18. TOTAL CORE RECOVERY FOR BORING 80%			
			19. SIGNATURE OF GEOLOGIST JB			
ELEV.	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	CORE REC %	SAMPLE NUMBER	REMARKS
-12.9	0		SAND, fine to medium grained, quartz, trace shell hash, trace shell fragments up to 0.5", light olive gray (5Y-6/2), (SP).		1	Sample #1 Depth = 2' Mean (mm): 0.18, Phi Sorting: 0.52 Shell: 0.30%, Silt: 1.12% (SP)
-17.7	5				2	Sample #2 Depth = 4' Mean (mm): 0.21, Phi Sorting: 0.81 Shell: 4.12%, Silt: 1.13% (SP)
-18.9	5		NO RECOVERY			
	6		End of Boring			
	19		Note: 1) Soils are field visually classified in accordance with the Unified Soil Classification System.			
	20					
				PROJECT: NEW RIVER INLET		HOLE NUMBER: NRVC-03-05

## **APPENDIX 6**

**2003 CPE INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS NEW  
RIVER INLET (DIGITAL COPY ONLY)**

## **APPENDIX 7**

**2003 CPE INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION  
CURVES/HISTOGRAMS NEW RIVER INLET (DIGITAL COPY ONLY)**

**APPENDIX 8**

**2003 CPE VIBRACORE PHOTOGRAPHS NEW RIVER INLET**





**NRVC-03-01**  
**8.0' - 10.0'**



New River Inlet



**NRVC-03-01**  
**10.0' - 10.7'**



New River Inlet

























**APPENDIX 9**

**2003 PENETROMETER RECORDS NEW RIVER INLET (DIGITAL COPY  
ONLY)**

**APPENDIX 10**

**2006 CPE VIBRACORE LOGS NEW RIVER INLET**



**Coastal Planning & Engineering**  
**2481 N.W. Boca Raton Blvd.**  
**Boca Raton, Florida 33431**  
Phone # 1-561-391-8102

### Legend for Geotechnical Data

- (SP), (SM), etc. Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs is initially based on visual field examinations and are identified on the core logs under the Classification of Materials Description. Final classifications are based on laboratory sieve analyses and are identified on the core logs in the Legend and under Remarks.
- Silty, shelly, etc. The indicated sediment type is present. The estimated percentage indicated by the Unified Soil Classification System descriptive terms selected to describe the sediment.

Definition of descriptive terms		Grain size terms
Clean	Free of silt or clay	Cobbles – above 3”
Very	To a high degree	Gravel – 3” sieve to # 4 sieve
Slightly	To a small degree	Coarse – 3” sieve to $\frac{3}{4}$ ” sieve
Isolated	Limited occurrence	Fine – $\frac{3}{4}$ ” sieve to # 4 sieve
Occasional	Infrequently present	Sand – # 4 sieve to # 200 sieve
Tight	Dense compacted	Coarse - # 4 sieve to # 10 sieve
		Medium - # 10 sieve to # 40 sieve
		Fine - # 40 sieve to # 200 sieve
		Fine – (silt or clay) < # 200 sieve

Proportional definition of descriptive terms	
<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %
Coarse to fine	All sizes
Coarse to medium	10 % fine
Medium to fine	10 % coarse
Coarse	10 % medium and fine
Medium	10 % coarse and fine
Fine	10 % coarse and medium

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



**Coastal Planning & Engineering**  
**2481 N.W. Boca Raton Blvd.**  
**Boca Raton, Florida 33431**  
**Phone # 1-561-391-8102**

### Legend for Geotechnical Data

GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



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### **Legend for Geotechnical Data**

The naming convention used by Coastal Planning and Engineering incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: vibracore (VC)
- Collection year (yy)
- Identification number
- Sample identification in the case of vibracores
- Composite samples are indicated by COMP following the identification number. COMP represents a composite developed to characterize beach compatible material.

#### **Format examples:**

- A) NRVC-03-01
- B) NRVC-03-01 S#2
- C) NTVC-06-19 COMP

Example A is a vibracore number 1, collected in the New River area in the year 2003.

Example B refers to sample number 2 taken from vibracore number 1, which was collected in the New River area in 2003.

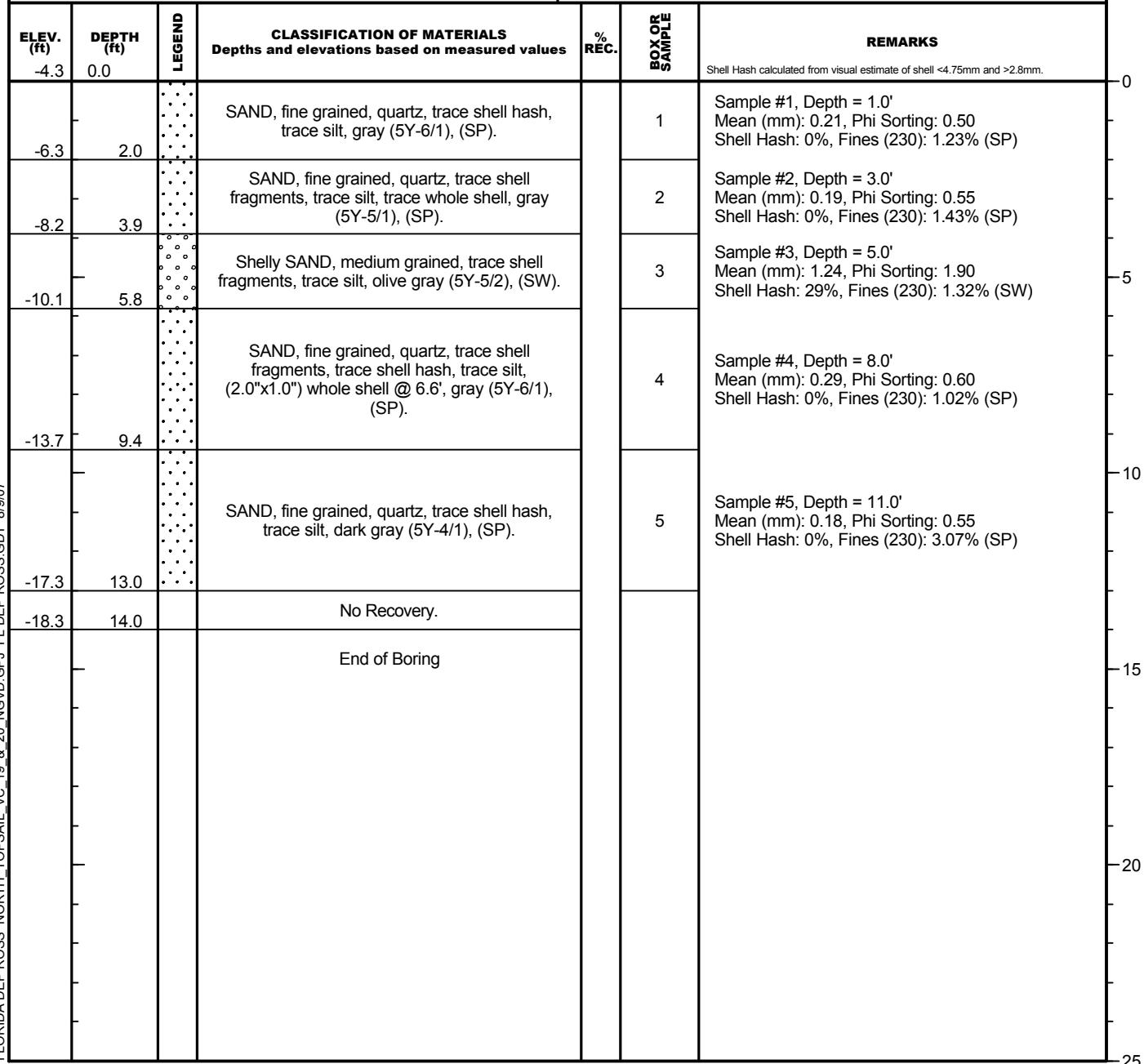
Example C illustrates a composite developed to characterize beach compatible material in vibracore 19, collected in North Topsail in 2006. This material is intended for use in beach construction.

No specific format is followed for area name abbreviations; however, the name of the area is always given in the appendix title page where the data is presented.

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

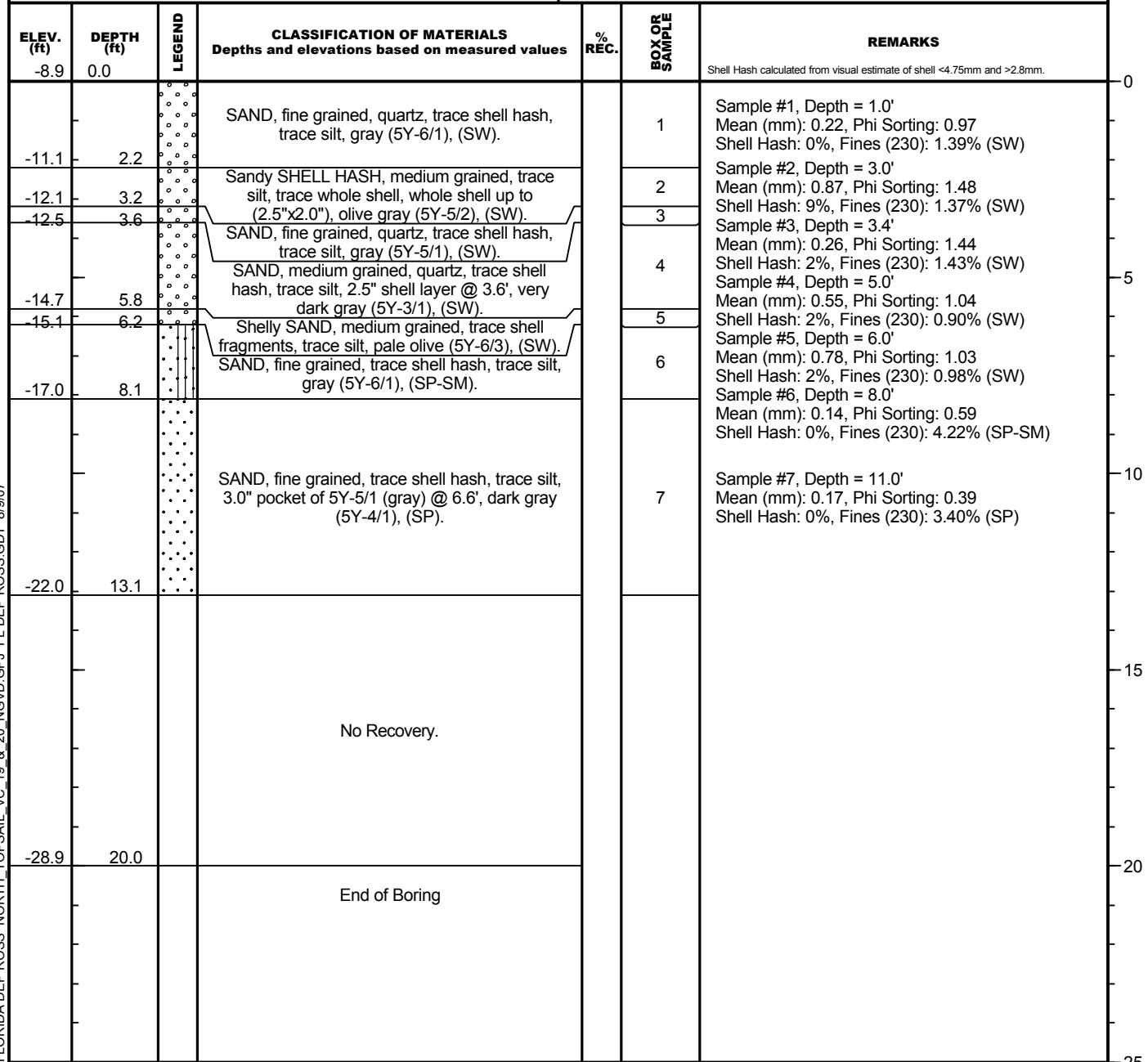
## Boring Designation NTVC-06-19

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>	
<b>1. PROJECT</b>		North Topsail 2006 Vibracores North Topsail, North Carolina		 <b>CPE</b> NORTH TOPSAIL, NORTH CAROLINA				
<b>2. BORING DESIGNATION</b>		<b>LOCATION COORDINATES</b>		9. SIZE AND TYPE OF BIT 3.0 In.				
NTVC-06-19		X = 2,500,572 Y = 285,674		10. COORDINATE SYSTEM/DATUM			HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983 NGVD 29
<b>3. DRILLING AGENCY</b>		<b>CONTRACTOR FILE NO.</b>		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER Pneumatic	
America Vibracore, Inc.				12. TOTAL SAMPLES			DISTURBED	UNDISTURBED (UD)
<b>4. NAME OF DRILLER</b>				13. TOTAL NUMBER CORE BOXES				
Fred Kaub				14. ELEVATION GROUND WATER				
<b>5. DIRECTION OF BORING</b>		<b>DEG. FROM VERTICAL</b>	<b>BEARING</b>	15. DATE BORING			STARTED 09-29-06 14:08	COMPLETED 09-29-06 14:28
<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED				16. ELEVATION TOP OF BORING			-4.3 Ft.	
<b>6. THICKNESS OF OVERTBURDEN</b>		0.0 Ft.		17. TOTAL RECOVERY FOR BORING			13 Ft.	
<b>7. DEPTH DRILLED INTO ROCK</b>		0.0 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR			Ken Wilson	
<b>8. TOTAL DEPTH OF BORING</b>		14.0 Ft.						



## Boring Designation NTVC-06-20

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
<b>1. PROJECT</b>				<b>9. SIZE AND TYPE OF BIT</b> 3.0 In.			
North Topsail 2006 Vibracores North Topsail, North Carolina							
<b>2. BORING DESIGNATION</b> NTVC-06-20		<b>LOCATION COORDINATES</b> X = 2,500,495 Y = 285,474		<b>10. COORDINATE SYSTEM/DATUM</b> HORIZONTAL North Carolina State Plane VERTICAL NAD 1983 NGVD 29			
<b>3. DRILLING AGENCY</b> America VibraCore, Inc.		<b>CONTRACTOR FILE NO.</b>		<b>11. MANUFACTURER'S DESIGNATION OF DRILL</b> Pneumatic <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER			
<b>4. NAME OF DRILLER</b> Fred Kaub				<b>12. TOTAL SAMPLES</b>			<b>DISTURBED</b> <input checked="" type="checkbox"/> <b>UNDISTURBED (UD)</b> <input type="checkbox"/>
<b>5. DIRECTION OF BORING</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		<b>DEG. FROM VERTICAL</b>	<b>BEARING</b>				
<b>6. THICKNESS OF OVERTBURDEN</b> 0.0 Ft.				<b>13. TOTAL NUMBER CORE BOXES</b>			
<b>7. DEPTH DRILLED INTO ROCK</b> 0.0 Ft.				<b>14. ELEVATION GROUND WATER</b>			
<b>8. TOTAL DEPTH OF BORING</b> 20.0 Ft.				<b>15. DATE BORING</b> STARTED 09-29-06 15:09 COMPLETED 09-29-06 15:16			
				<b>16. ELEVATION TOP OF BORING</b> -8.9 Ft.			
				<b>17. TOTAL RECOVERY FOR BORING</b> 13.1 Ft.			
				<b>18. SIGNATURE AND TITLE OF INSPECTOR</b> Ken Wilson			



## **APPENDIX 11**

**2006 CPE INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS NEW  
RIVER INLET (DIGITAL COPY ONLY)**

## **APPENDIX 12**

**2006 CPE INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION  
CURVES/HISTOGRAMS NEW RIVER INLET (DIGITAL COPY ONLY)**

**APPENDIX 13**

**2006 CPE VIBRACORE PHOTOGRAPHS NEW RIVER INLET**



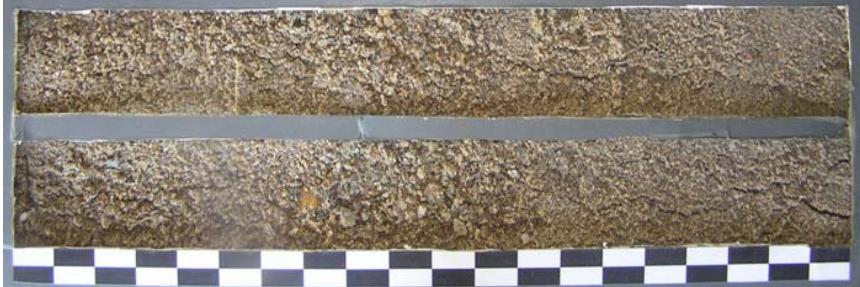
NORTH TOPSAIL  
BEACH  
NTVC-06-19  
0.0' - 2.0'



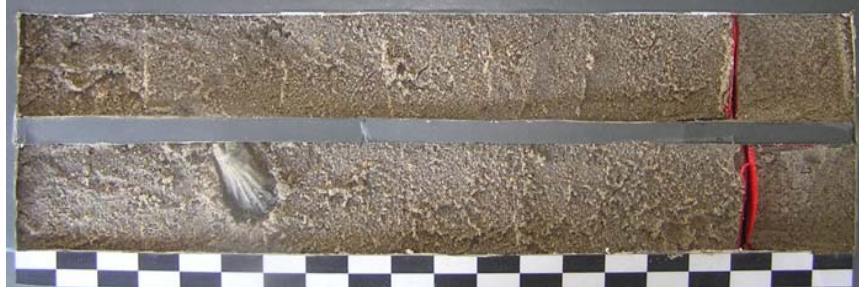
NORTH TOPSAIL  
BEACH  
NTVC-06-19  
2.0' - 4.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-19  
4.0' - 6.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-19  
6.0' - 8.0'





**NORTH TOPSAIL  
BEACH**  
**NTVC-06-19**  
**8.0' - 10.0'**



**NORTH TOPSAIL  
BEACH**  
**NTVC-06-19**  
**10.0' - 12.0'**



**NORTH TOPSAIL  
BEACH**  
**NTVC-06-19**  
**12.0' - 12.8'**





NORTH TOPSAIL  
BEACH  
NTVC-06-20  
0.0' - 2.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-20  
2.0' - 4.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-20  
4.0' - 6.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-20  
6.0' - 8.0'





NORTH TOPSAIL  
BEACH  
NTVC-06-20  
8.0' - 10.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-20  
10.0' - 12.0'



NORTH TOPSAIL  
BEACH  
NTVC-06-20  
12.0' - 12.6'

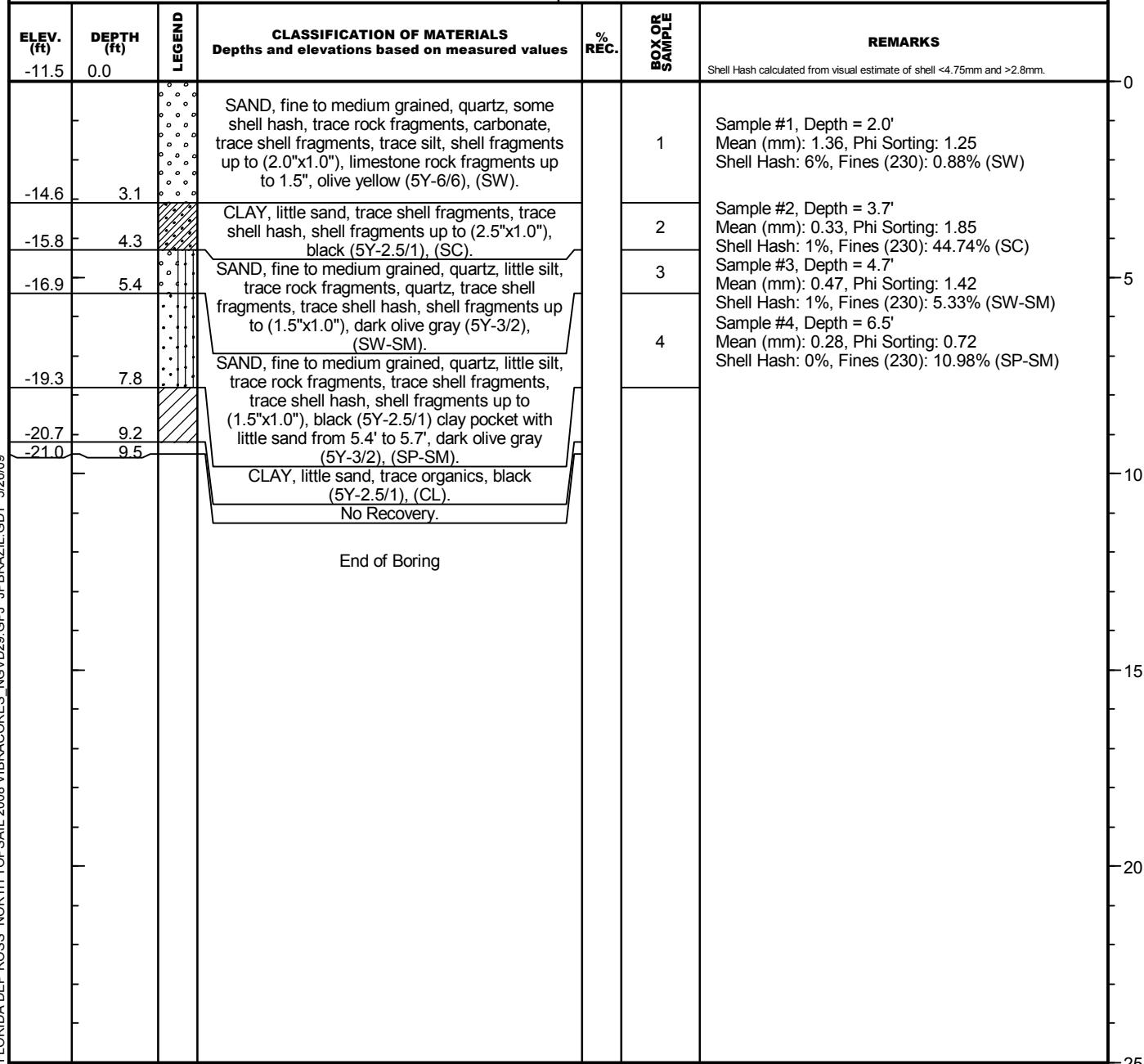


**APPENDIX 14**

**2008 CPE VIBRACORE LOGS NEW RIVER INLET**

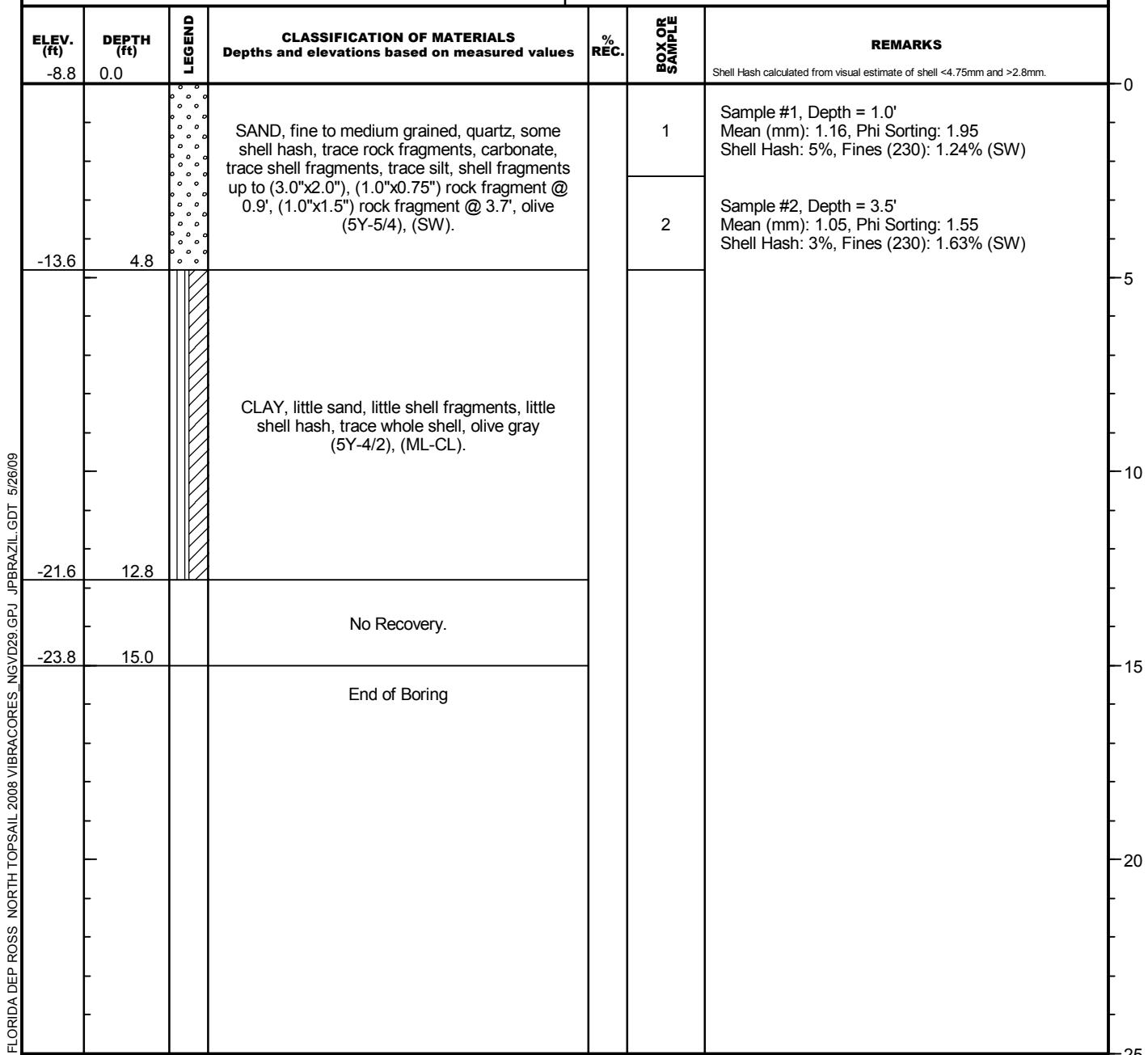
## Boring Designation NTVC-08-01

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT				9. SIZE AND TYPE OF BIT 3.0 In.			
North Topsail Beach/New River Inlet North Topsail Beach, North Carolina							
2. BORING DESIGNATION		LOCATION COORDINATES		10. COORDINATE SYSTEM/DATUM			HORIZONTAL      VERTICAL
NTVC-08-01		X = 2,499,285 Y = 287,402		North Carolina State Plane			NAD 1983 NGVD 29
3. DRILLING AGENCY		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
Athena Technologies				Hydraulic			
4. NAME OF DRILLER				12. TOTAL SAMPLES			DISTURBED      UNDISTURBED (UD)
Walter Sexton							
5. DIRECTION OF BORING		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES			
<input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED				14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING			STARTED      COMPLETED
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		11-08-08 11:31			11-08-08 11:36
8. TOTAL DEPTH OF BORING		9.5 Ft.		16. ELEVATION TOP OF BORING			-11.5 Ft.
				17. TOTAL RECOVERY FOR BORING			9.2 Ft.
				18. SIGNATURE AND TITLE OF INSPECTOR			KW



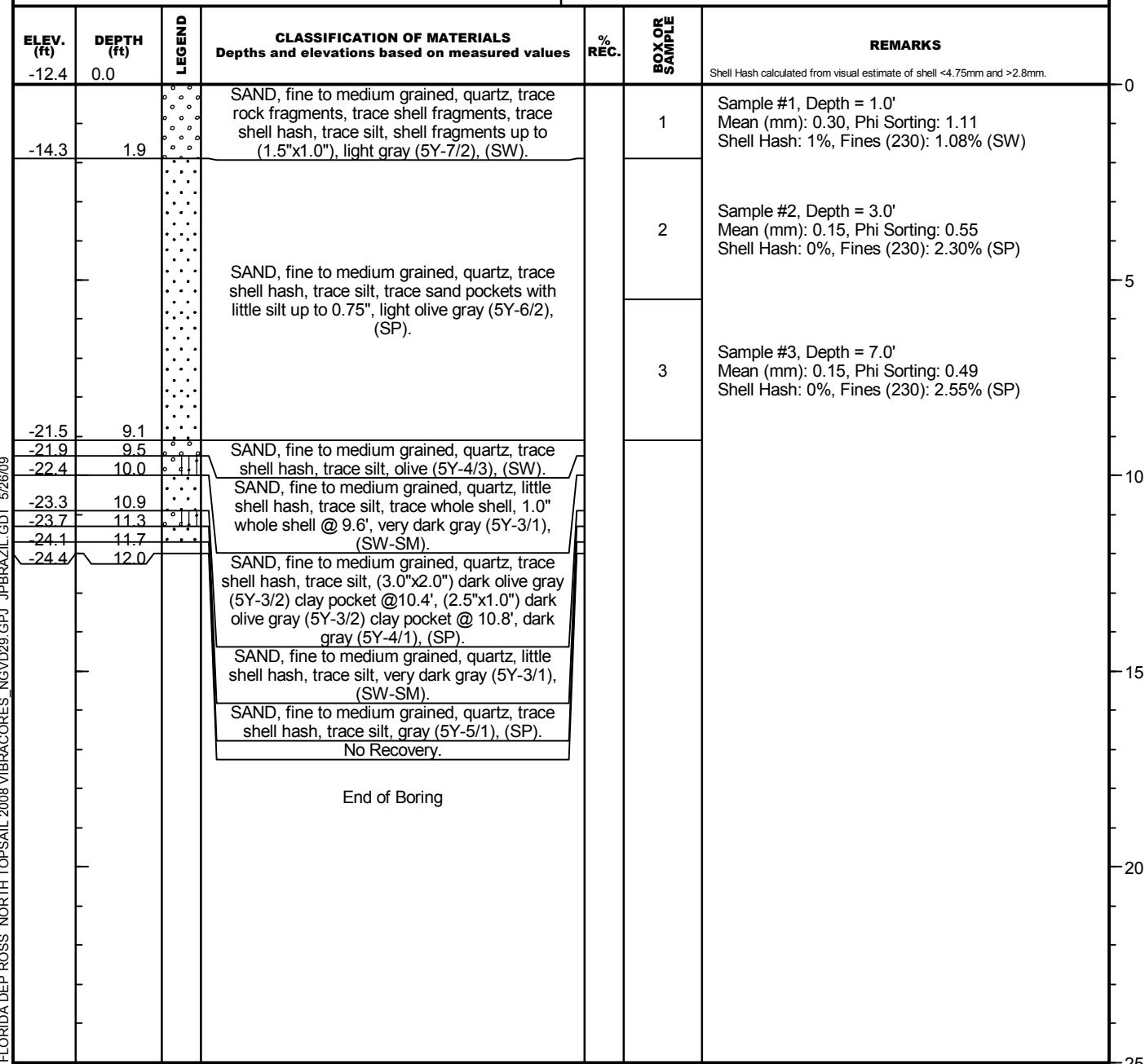
## Boring Designation NTVC-08-02

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail Beach/New River Inlet North Topsail Beach, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.		
2. BORING DESIGNATION NTVC-08-02				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983 VERTICAL NGVD 29		11. MANUFACTURER'S DESIGNATION OF DRILL Hydraulic
3. DRILLING AGENCY Athena Technologies		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)		13. TOTAL NUMBER CORE BOXES		
4. NAME OF DRILLER Walter Sexton		14. ELEVATION GROUND WATER		15. DATE BORING STARTED COMPLETED		11-08-08 00:30 11-08-08 00:35
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	16. ELEVATION TOP OF BORING -8.8 Ft.		
6. THICKNESS OF OVERBURDEN 0.0 Ft.		17. TOTAL RECOVERY FOR BORING 12.8 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR KW		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.						
8. TOTAL DEPTH OF BORING 15.0 Ft.						



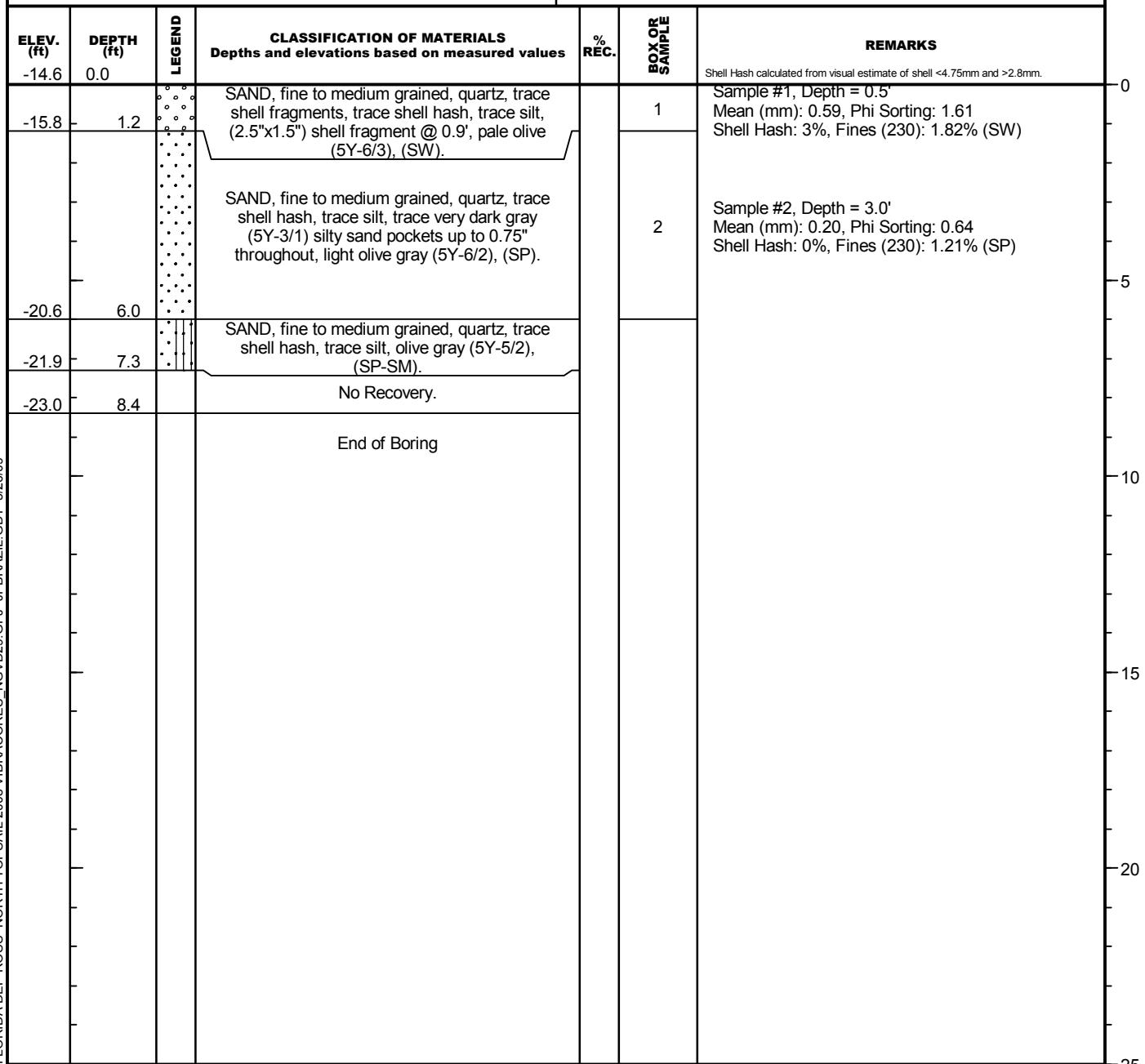
## Boring Designation NTVC-08-03

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail Beach/New River Inlet North Topsail Beach, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.		
2. BORING DESIGNATION NTVC-08-03				LOCATION COORDINATES X = 2,500,721 Y = 285,326		10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983
3. DRILLING AGENCY Athena Technologies		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL AUTO HAMMER Hydraulic		<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Walter Sexton				12. TOTAL SAMPLES DISTURBED		UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES		
6. THICKNESS OF OVERTBURDEN 0.0 Ft.				14. ELEVATION GROUND WATER		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.				15. DATE BORING STARTED		COMPLETED
8. TOTAL DEPTH OF BORING 12.0 Ft.				16. ELEVATION TOP OF BORING -12.4 Ft.		
				17. TOTAL RECOVERY FOR BORING 11.7 Ft.		
				18. SIGNATURE AND TITLE OF INSPECTOR KW		



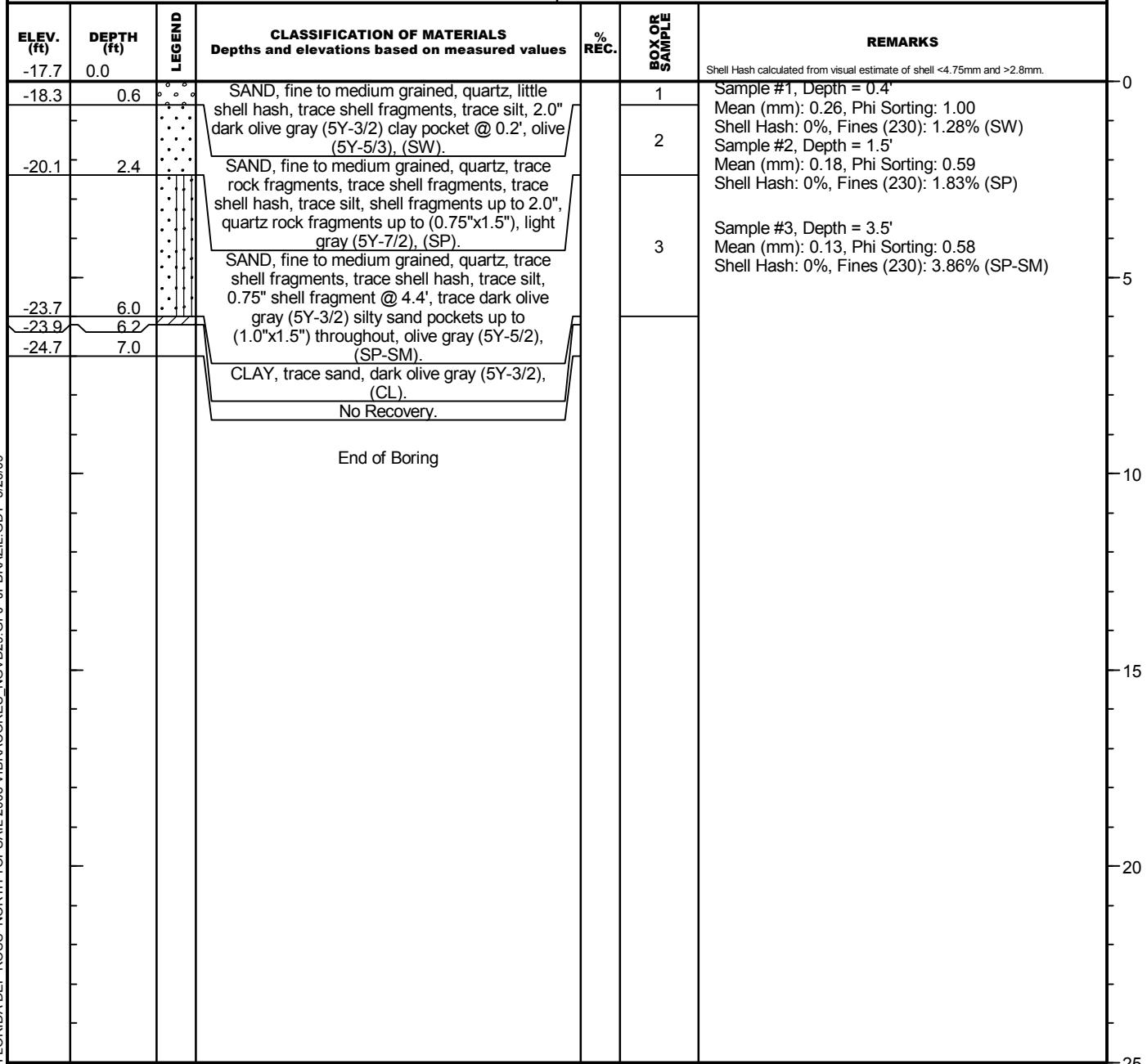
## Boring Designation NTVC-08-04

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail Beach/New River Inlet North Topsail Beach, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.		
2. BORING DESIGNATION NTVC-08-04		LOCATION COORDINATES X = 2,500,541 Y = 285,033		10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983		VERTICAL NGVD 29
3. DRILLING AGENCY Athena Technologies		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL AUTO HAMMER Hydraulic		MANUAL HAMMER
4. NAME OF DRILLER Walter Sexton				12. TOTAL SAMPLES DISTURBED		UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES		
6. THICKNESS OF OVERTBURDEN 0.0 Ft.				14. ELEVATION GROUND WATER		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.				15. DATE BORING STARTED 11-09-08 08:33		COMPLETED 11-09-08 08:38
8. TOTAL DEPTH OF BORING 8.4 Ft.				16. ELEVATION TOP OF BORING -14.6 Ft.		
				17. TOTAL RECOVERY FOR BORING 7.3 Ft.		
				18. SIGNATURE AND TITLE OF INSPECTOR KW		



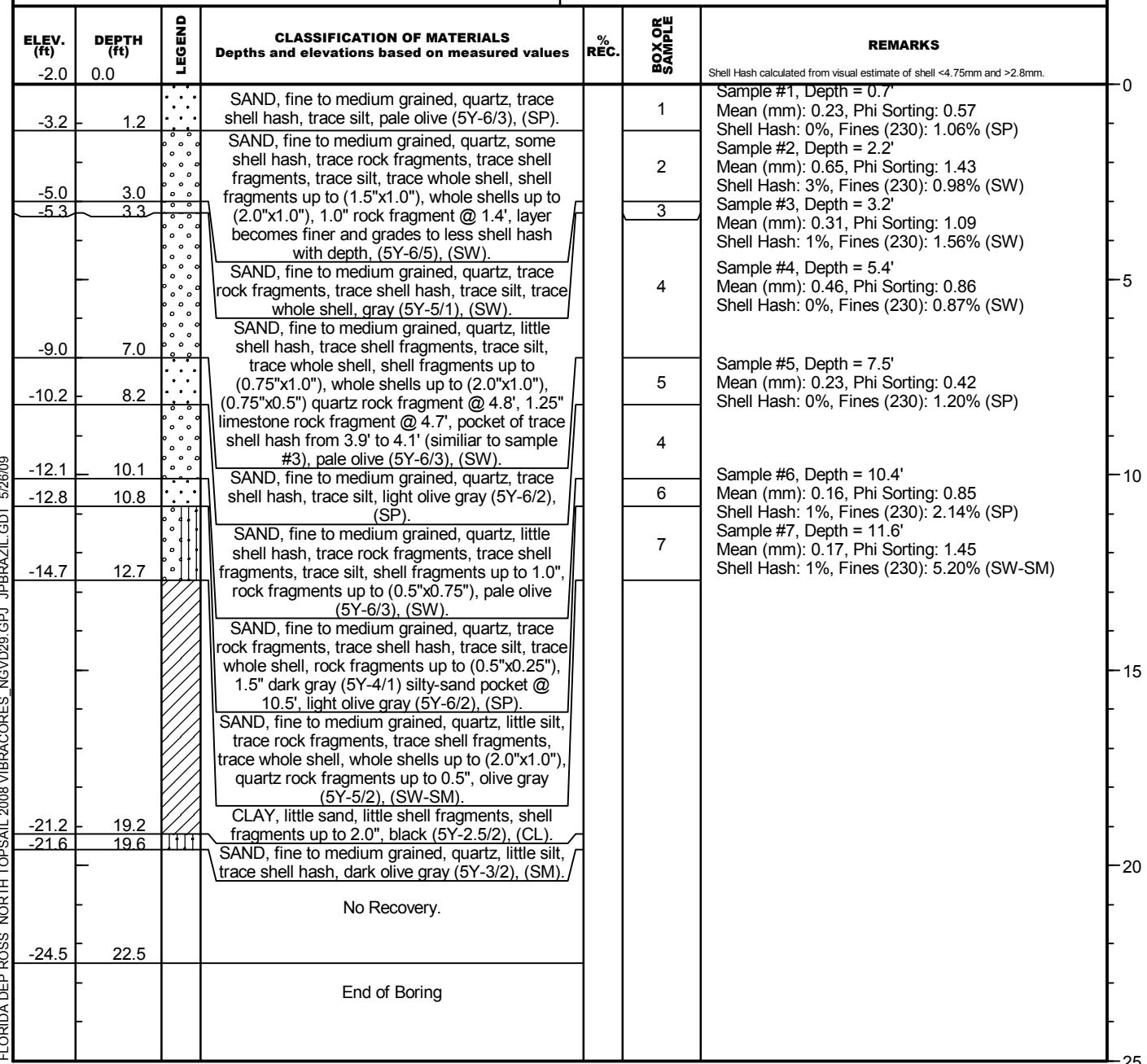
## Boring Designation NTVC-08-05

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>	
1. PROJECT		North Topsail Beach/New River Inlet North Topsail Beach, North Carolina		9. SIZE AND TYPE OF BIT		3.0 In.	
2. BORING DESIGNATION		NTVC-08-05		10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane NAD 1983	VERTICAL NGVD 29
3. DRILLING AGENCY		Athena Technologies		11. MANUFACTURER'S DESIGNATION OF DRILL		<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER Hydraulic	
4. NAME OF DRILLER		Walter Sexton		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
5. DIRECTION OF BORING		VERTICAL <input checked="" type="checkbox"/>	DEG. FROM VERTICAL <input type="checkbox"/>	BEARING <input type="checkbox"/>	13. TOTAL NUMBER CORE BOXES		
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		14. ELEVATION GROUND WATER			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		15. DATE BORING		STARTED 11-09-08 08:55	COMPLETED 11-09-08 09:01
8. TOTAL DEPTH OF BORING		7.0 Ft.		16. ELEVATION TOP OF BORING		-17.7 Ft.	
17. TOTAL RECOVERY FOR BORING		6.2 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR		KW	



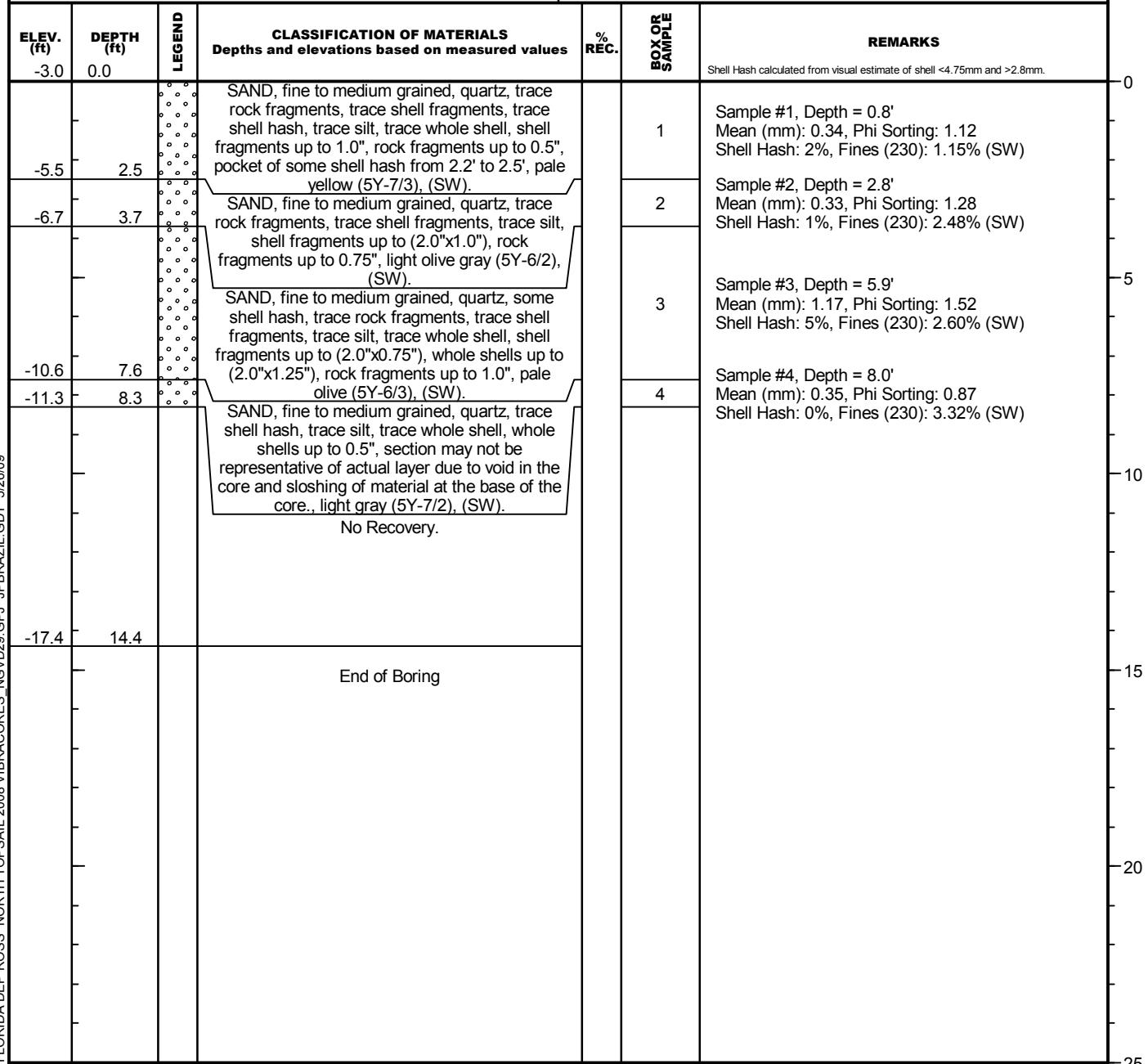
## Boring Designation NTVC-08-06

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail Beach/New River Inlet North Topsail Beach, North Carolina				 <b>CPE</b> COASTAL PLANNING & ENGINEERING			9. SIZE AND TYPE OF BIT      3.0 In.
2. BORING DESIGNATION NTVC-08-06		LOCATION COORDINATES X = 2,500,294 Y = 286,015		10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983 NGVD 29
3. DRILLING AGENCY Athena Technologies		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL		<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER Hydraulic	
4. NAME OF DRILLER Walter Sexton				12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES			
6. THICKNESS OF OVERTBURDEN      0.0 Ft.				14. ELEVATION GROUND WATER			
7. DEPTH DRILLED INTO ROCK      0.0 Ft.				15. DATE BORING		STARTED 11-23-08 09:05	COMPLETED 11-23-08 10:03
8. TOTAL DEPTH OF BORING      22.5 Ft.				16. ELEVATION TOP OF BORING		-2.0 Ft.	
17. TOTAL RECOVERY FOR BORING      19.6 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR		KW			



## Boring Designation NTVC-08-07

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail Beach/New River Inlet North Topsail Beach, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
2. BORING DESIGNATION NTVC-08-07		LOCATION COORDINATES X = 2,499,997 Y = 286,303		10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983 VERTICAL NGVD 29
3. DRILLING AGENCY Athena Technologies		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL Hydraulic			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Walter Sexton				12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		14. ELEVATION GROUND WATER			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		15. DATE BORING			STARTED COMPLETED 11-23-08 11:03 11-23-08 11:13
8. TOTAL DEPTH OF BORING		14.4 Ft.		16. ELEVATION TOP OF BORING			-3.0 Ft.
				17. TOTAL RECOVERY FOR BORING			8.3 Ft.
				18. SIGNATURE AND TITLE OF INSPECTOR			KW



## **APPENDIX 15**

**2008 CPE INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS NEW  
RIVER INLET (DIGITAL COPY ONLY)**

## **APPENDIX 16**

**2008 CPE INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION  
CURVES/HISTOGRAMS NEW RIVER INLET (DIGITAL COPY ONLY)**

**APPENDIX 17**

**2003, 2006, AND 2008 COMPOSITE VIBRACORE GRANULARMETRIC  
REPORTS NEW RIVER INLET (DIGITAL COPY ONLY)**

## **APPENDIX 18**

**2003, 2006, AND 2008 COMPOSITE VIBRACORE GRAIN SIZE DISTRIBUTION  
CURVES/ HISTOGRAMS NEW RIVER INLET (DIGITAL COPY ONLY)**

## **APPENDIX 19**

### **2005 AND 2006 BORROW AREA COMPOSITE SUMMARY TABLES OFFSHORE BORROW AREA**

COMPOSITE SUMMARY TABLE NORTH TOPSAIL BEACH VIBRACORES									
VIBRACORE	VOLUME (CY)	EFFECTIVE LENGTH (FT)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	% Carbonate		
NTVC-05-01 Composite			Vibracore outside of borrow area.						
NTVC-05-02 Composite	109458	7.9	0.17	2.56	0.79	5.49	10		
NTVC-05-03 Composite			Vibracore outside of borrow area.						
NTVC-05-04 Composite			Vibracore outside of borrow area.						
NTVC-05-05a Composite	4273	5.1	0.22	2.19	1.18	5.71	10		
NTVC-05-05b Composite	334046	8.1	0.2	2.3	0.99	5.44	10		
NTVC-05-05c Composite	18976	7.1	0.21	2.27	1.04	5.52	10		
NTVC-05-05d Composite	103118	16.1	0.18	2.51	0.77	6.47	10		
NTVC-05-06a Composite	55903	6.4	0.20	2.33	0.75	6.05	30		
NTVC-05-06b Composite	242408	9.4	0.19	2.37	0.7	6.63	30		
NTVC-05-06c Composite	36694	8.4	0.19	2.36	0.72	6.49	30		
NTVC-05-07a Composite	32786	10.4	0.18	2.45	0.46	3.49	10		
NTVC-05-07b Composite	196967	7.7	0.2	2.4	0.5	3.2	10		
NTVC-05-08a Composite	119198	6.5	0.24	2.03	1.43	5.08	20		
NTVC-05-08b Composite	167380	8.5	0.23	2.15	1.29	5.7	20		
NTVC-05-08c Composite	2674	9.5	0.22	2.19	1.25	6.04	20		
NTVC-05-09 Composite	185058	7.4	0.19	2.39	0.54	5.62	20		
NTVC-05-10 Composite			Vibracore outside of borrow area.						
NTVC-05-11 Composite	186934	9.2	0.16	2.68	0.4	5.92	10		
NTVC-05-12 Composite	162714	7.8	0.18	2.51	0.36	5.28	10		
NTVC-05-13 Composite	46282	2.4	0.41	1.28	2.17	8.88	20		
NTVC-05-14a Composite	145686	6.1	0.20	2.34	0.56	3.46	20		
NTVC-05-14b Composite	19770	4.1	0.22	2.21	0.58	2.9	20		
NTVC-05-15 Composite	356839	8.5	0.33	1.59	0.57	1.75	20		
NTVC-05-15a Composite	109235	16.0	0.24	2.08	0.77	4.95	20		
NTVC-05-15b Composite	74668	4.5	0.33	1.62	0.51	1.79	20		
NTVC-05-16 Composite	112435	4.5	0.19	2.36	1.13	5.83	20		
NTVC-05-17 Composite			Vibracore outside of borrow area.						
NTVC-05-18 Composite			Vibracore outside of borrow area.						
NTVC-05-19a Composite	248706	15.9	0.16	2.60	0.43	4.75	10		
NTVC-05-19b Composite	139802	5.9	0.18	2.45	0.48	4.18	10		
NTVC-05-20 Composite			Vibracore outside of borrow area.						
NTVC-05-21 Composite	98321	6.8	0.19	2.36	0.88	8.13	10		
NTVC-05-22 Composite			Vibracore outside of borrow area.						
NTVC-05-23 Composite			Vibracore outside of borrow area.						
NTVC-05-24 Composite	303575	8.0	0.25	1.99	1.34	9.16	10		
NTVC-05-25 Composite	301281	8.1	0.25	2.01	1.41	5.74	10		
NTVC-05-26 Composite			Vibracore outside of borrow area.						
NTVC-05-27 Composite			Vibracore outside of borrow area.						
NTVC-06-01 Composite			Vibracore outside of borrow area.						
NTVC-06-02 Composite			Vibracore outside of borrow area.						
NTVC-06-03a Composite	231458	10.6	0.25	2.01	1.55	3.52	10		
NTVC-06-03b Composite	62743	14.6	0.23	2.15	1.36	4.58	10		
NTVC-06-04 Composite			Vibracore outside of borrow area.						
NTVC-06-05 Composite			Vibracore outside of borrow area.						
NTVC-06-06a Composite	99191	7.3	0.20	2.32	0.73	6.15	10		
NTVC-06-06b Composite	203799	9.3	0.19	2.39	0.70	6.84	10		
NTVC-06-07a Composite	157806	7.9	0.22	2.16	1.22	8.78	20		
NTVC-06-07b Composite	26462	13.9	0.29	1.78	1.76	10.09	20		
NTVC-06-07c Composite	3463	9.9	0.21	2.24	1.13	8.92	20		
NTVC-06-08 Composite			Vibracore outside of borrow area.						
NTVC-06-09 Composite	128761	16.2	0.20	2.31	0.67	7.41	20		
NTVC-06-10a Composite	71167	10.3	0.22	2.16	1.05	7.12	20		
NTVC-06-10b Composite	194541	14.3	0.21	2.25	0.92	6.83	20		
NTVC-06-11a Composite	147536	8.0	0.19	2.40	0.51	7.62	20		
NTVC-06-11b Composite	39096	9.0	0.18	2.44	0.54	7.43	20		
NTVC-06-12a Composite	6768	6.7	0.20	2.34	0.63	8.39	10		
NTVC-06-12b Composite	372675	10.2	0.19	2.39	0.60	7.92	10		
NTVC-06-12c Composite	58466	7.7	0.19	2.36	0.62	8.16	10		
NTVC-06-13a Composite	122357	6.2	0.25	1.99	1.77	10.71	20		
NTVC-06-13b Composite	120304	9.7	0.26	1.96	1.76	8.76	20		
NTVC-06-13c Composite	30716	9.2	0.26	1.93	1.80	8.97	20		
NTVC-06-14 Composite	214948	9.0	0.19	2.37	0.62	7.82	20		
NTVC-06-15 Composite			Vibracore outside of borrow area.						
NTVC-06-16 Composite			Vibracore outside of borrow area.						
NTVC-06-17a Composite	30810	8.4	0.23	2.14	1.27	11.02	30		
NTVC-06-17b Composite	24183	8.9	0.23	2.14	1.24	10.85	30		
NTVC-06-18a Composite	18488	6.2	0.23	2.14	1.34	6.42	30		
NTVC-06-18b Composite	270368	9.7	0.21	2.22	1.13	7.34	30		
Fine BA Composite	6194454		0.21	2.27	1.02	6.40	15.81		
Coarse BA Composite	356839		0.33	1.59	0.57	1.75	20		

**COMPOSITE DATA TABLE  
NORTH TOPSAIL BEACH VIBRACORES**

SAMPLE I. D.	VOLUME (cy)	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	GRAVEL		CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)						SAND						FINE PAN						
							-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	
NTVC-05-01 Composite																											
NTVC-05-02 Composite	109458	7.9	0.17	2.56	0.79	5.49	0.00	0.00	0.00	0.25	0.37	0.40	0.52	0.87	1.23	1.71	2.23	2.89	4.17	5.67	8.84	19.43	83.41	93.23	94.14	94.51	99.89
NTVC-05-03 Composite																											
NTVC-05-04 Composite																											
NTVC-05-05a Composite																											
NTVC-05-05b Composite	334046	8.1	0.20	2.30	0.99	5.44	0.00	0.00	0.48	0.84	1.21	1.44	1.75	2.22	2.71	3.22	3.61	4.00	4.71	5.38	10.19	54.48	87.19	91.76	94.29	94.55	99.89
NTVC-05-05c Composite	18976	7.1	0.21	2.27	1.04	5.52	0.00	0.00	0.54	0.95	1.38	1.64	1.98	2.52	3.07	3.66	4.08	4.53	5.32	6.03	10.82	55.25	86.74	91.74	94.22	94.48	99.90
NTVC-05-05d Composite	103118	16.1	0.18	2.51	0.77	6.47	0.00	0.00	0.24	0.42	0.61	0.72	0.88	1.12	1.37	1.63	1.82	2.03	2.42	2.85	5.73	35.02	84.09	91.33	93.20	93.54	99.90
NTVC-05-06a Composite	55903	6.4	0.20	2.33	0.75	6.05	0.00	0.00	0.00	0.16	0.20	0.45	0.67	0.98	1.53	2.21	3.19	4.62	6.70	13.10	52.77	89.62	90.71	93.72	93.96	99.88	
NTVC-05-06b Composite	242408	9.4	0.19	2.37	0.70	6.63	0.00	0.00	0.00	0.11	0.14	0.32	0.47	0.74	1.24	1.87	2.73	3.95	5.62	11.09	50.80	88.86	89.71	93.11	93.36	99.87	
NTVC-05-06c Composite	36694	8.4	0.19	2.36	0.72	6.49	0.00	0.00	0.00	0.12	0.16	0.35	0.52	0.80	1.31	1.96	2.84	4.12	5.90	11.60	53.00	89.05	89.97	93.26	93.51	99.87	
NTVC-05-07a Composite	32786	10.4	0.18	2.45	0.46	3.49	0.00	0.00	0.00	0.01	0.03	0.05	0.07	0.12	0.20	0.34	0.61	1.05	2.08	2.77	51.91	91.11	95.56	96.20	96.51	99.90	
NTVC-05-07b Composite	196967	7.7	0.19	2.42	0.48	3.20	0.00	0.00	0.00	0.01	0.03	0.06	0.09	0.16	0.26	0.45	0.80	1.38	2.71	8.88	55.68	92.00	95.89	96.51	96.80	99.90	
NTVC-05-08a Composite	119198	6.5	0.24	2.03	1.43	5.08	0.00	0.00	1.19	2.08	3.02	3.59	4.19	5.40	6.72	8.10	9.06	10.11	11.60	12.57	16.72	53.29	89.66	91.31	94.68	94.91	99.91
NTVC-05-08b Composite	167380	8.5	0.23	2.15	1.29	5.70	0.00	0.00	0.91	1.59	2.31	2.74	3.20	4.15	5.19	6.33	7.09	7.92	9.10	9.91	13.89	49.88	88.58	91.29	94.04	94.29	99.91
NTVC-05-08c Composite	2674	9.5	0.22	2.19	1.25	6.04	0.00	0.00	0.81	1.43	2.10	2.50	2.93	3.84	4.82	5.88	6.58	7.34	8.43	9.20	13.00	47.95	87.93	91.16	93.70	93.97	99.91
NTVC-05-09 Composite	185058	7.4	0.19	2.39	0.54	5.62	0.00	0.00	0.07	0.08	0.08	0.12	0.26	0.54	0.80	0.97	1.17	1.59	2.41	7.61	57.49	90.45	92.79	94.22	94.40	99.94	
NTVC-05-10 Composite																											
NTVC-05-11 Composite	186934	9.2	0.16	2.68	0.40	5.92	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.07	0.10	0.25	0.59	3.07	23.70	83.13	89.03	93.70	94.08	99.86	
NTVC-05-12 Composite	162714	7.8	0.18	2.51	0.36	5.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.12	0.29	0.54	4.17	45.98	89.76	94.01	94.44	94.73	99.89	
NTVC-05-13 Composite	46282	0.4	0.41	1.28	2.17	8.88	0.00	2.11	4.47	7.80	10.40	11.33	12.69	15.28	18.05	20.41	22.30	23.89	24.94	25.81	29.41	56.19	86.46	90.41	90.91	91.12	99.78
NTVC-05-14a Composite	145686	6.1	0.20	2.34	0.56	3.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.38	1.57	3.18	5.97	15.55	57.80	91.33	95.63	96.15	96.53	99.93		
NTVC-05-14b Composite	19770	4.1	0.22	2.21	0.58	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.55	2.29	4.58	8.58	21.44	71.79	93.05	96.20	96.74	97.09	99.94		
NTVC-05-15 Composite	356839	8.5	0.33	1.59	0.57	1.75	0.00	0.00	0.00	0.00	0.22	0.31	0.63	0.90	1.34	2.43	7.98	37.87	82.24	94.27	97.78	98.17	98.22	98.25	99.98		
NTVC-05-15a Composite	109235	16.0	0.24	2.08	0.77	4.95	0.00	0.00	0.00	0.00	0.13	0.19	0.39	0.56	0.82	1.46	4.74	22.32	48.06	56.76	87.03	94.32	94.86	95.05	99.96		
NTVC-05-15b Composite	74668	4.5	0.33	1.62	0.51	1.79	0.00	0.00	0.00	0.00	0.12	0.17	0.29	0.51	0.91	2.04	7.07	34.30	82.44	95.41	97.86	98.15	98.20	98.21	99.96		
NTVC-05-16 Composite	112435	4.5</																									

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY NORTH TOPSAIL BEACH VIBRACORES (1 of 9)				
SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-05-01#1	7.64	92.27	0.09	0.00
NTVC-05-01#2	13.46	85.01	1.38	0.15
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-01#3	18.85	80.47	0.54	0.14
NTVC-05-01#4	15.70	83.60	0.43	0.27
NTVC-05-01#5	15.60	83.68	0.72	0.00
<b>NTVC-05-01 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-02#1	1.30	92.53	3.93	2.24
NTVC-05-02#2	5.81	93.95	0.24	0.00
NTVC-05-02#3	7.60	92.38	0.02	0.00
NTVC-05-02#4	10.44	89.56	0.00	0.00
NTVC-05-02#5	10.52	89.48	0.00	0.00
<b>NTVC-05-02 Composite</b>	<b>5.49</b>	<b>93.28</b>	<b>0.84</b>	<b>0.40</b>
NTVC-05-03#1	2.04	97.85	0.11	0.00
NTVC-05-03#2	16.84	82.56	0.60	0.00
<b>NTVC-05-03 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-04#1	14.75	84.21	0.61	0.43
NTVC-05-04#2	2.23	97.77	0.00	0.00
NTVC-05-04#3	1.99	98.01	0.00	0.00
NTVC-05-04#2	2.23	97.77	0.00	0.00
NTVC-05-04#5	7.50	91.91	0.14	0.45
NTVC-05-04#6	15.45	84.25	0.23	0.07
NTVC-05-04#7	19.89	79.04	0.57	0.50
<b>NTVC-05-04 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-05#1	6.58	93.41	0.01	0.00
NTVC-05-05#2	5.00	94.87	0.13	0.00
NTVC-05-05#3	6.50	93.50	0.00	0.00
NTVC-05-05#4	8.62	91.38	0.00	0.00
<b>NTVC-05-05a Composite</b>	<b>5.71</b>	<b>90.05</b>	<b>1.94</b>	<b>2.29</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-05#1	6.58	93.41	0.01	0.00
NTVC-05-05#2	5.00	94.87	0.13	0.00
NTVC-05-05#3	6.50	93.50	0.00	0.00
NTVC-05-05#4	8.62	91.38	0.00	0.00
<b>NTVC-05-05b Composite</b>	<b>5.44</b>	<b>91.84</b>	<b>1.27</b>	<b>1.44</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-05#1	6.58	93.41	0.01	0.00
NTVC-05-05#2	5.00	94.87	0.13	0.00
NTVC-05-05#3	6.50	93.50	0.00	0.00
NTVC-05-05#4	8.62	91.38	0.00	0.00
<b>NTVC-05-05c Composite</b>	<b>5.52</b>	<b>91.41</b>	<b>1.43</b>	<b>1.64</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-05#1	6.58	93.41	0.01	0.00
NTVC-05-05#2	5.00	94.87	0.13	0.00
NTVC-05-05#3	6.50	93.50	0.00	0.00
NTVC-05-05#4	8.62	91.38	0.00	0.00
<b>NTVC-05-05d Composite</b>	<b>6.47</b>	<b>92.17</b>	<b>0.64</b>	<b>0.72</b>

**PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY**  
**NORTH TOPSAIL BEACH VIBRACORES (2 of 9)**

SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-05-06#1	1.62	95.65	2.04	0.69
NTVC-05-06#2	7.91	91.85	0.24	0.00
NTVC-05-06#3	13.56	82.34	0.73	3.37
<b>NTVC-05-06a Composite</b>	<b>6.05</b>	<b>92.98</b>	<b>0.77</b>	<b>0.20</b>
NTVC-05-06#1	1.62	95.65	2.04	0.69
NTVC-05-06#2	7.91	91.85	0.24	0.00
NTVC-05-06#3	13.56	82.34	0.73	3.37
<b>NTVC-05-06b Composite</b>	<b>6.63</b>	<b>92.62</b>	<b>0.60</b>	<b>0.14</b>
NTVC-05-06#1	1.62	95.65	2.04	0.69
NTVC-05-06#2	7.91	91.85	0.24	0.00
NTVC-05-06#3	13.56	82.34	0.73	3.37
<b>NTVC-05-06c Composite</b>	<b>6.49</b>	<b>92.71</b>	<b>0.65</b>	<b>0.16</b>
NTVC-05-07#1	1.55	97.39	0.82	0.24
NTVC-05-07#2	3.38	96.61	0.01	0.00
NTVC-05-07#3	3.56	96.43	0.01	0.00
NTVC-05-07#4	6.15	93.85	0.00	0.00
<b>NTVC-05-07a Composite</b>	<b>3.49</b>	<b>96.39</b>	<b>0.09</b>	<b>0.03</b>
NTVC-05-07#1	1.55	97.39	0.82	0.24
NTVC-05-07#2	3.38	96.61	0.01	0.00
NTVC-05-07#3	3.56	96.43	0.01	0.00
NTVC-05-07#4	6.15	93.85	0.00	0.00
<b>NTVC-05-07b Composite</b>	<b>3.20</b>	<b>96.64</b>	<b>0.13</b>	<b>0.03</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-08#2	4.91	94.92	0.17	0.00
NTVC-05-08#3	7.70	92.09	0.21	0.00
NTVC-05-08#4	9.31	88.36	1.69	0.64
<b>NTVC-05-08a Composite</b>	<b>5.08</b>	<b>88.18</b>	<b>3.14</b>	<b>3.59</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-08#2	4.91	94.92	0.17	0.00
NTVC-05-08#3	7.70	92.09	0.21	0.00
NTVC-05-08#4	9.31	88.36	1.69	0.64
<b>NTVC-05-08b Composite</b>	<b>5.70</b>	<b>89.10</b>	<b>2.45</b>	<b>2.74</b>
NTVC-05-08#1	1.16	45.49	24.20	29.15
NTVC-05-08#2	4.91	94.92	0.17	0.00
NTVC-05-08#3	7.70	92.09	0.21	0.00
NTVC-05-08#4	9.31	88.36	1.69	0.64
<b>NTVC-05-08c Composite</b>	<b>6.04</b>	<b>89.14</b>	<b>2.32</b>	<b>2.50</b>

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY NORTH TOPSAIL BEACH VIBRACORES (3 of 9)				
SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-05-09#1	7.42	90.16	1.90	0.52
NTVC-05-09#2	5.41	94.45	0.14	0.00
NTVC-05-09#3	4.88	94.88	0.24	0.00
NTVC-05-09#4	8.32	88.25	2.35	1.08
<b>NTVC-05-09 Composite</b>	<b>5.62</b>	<b>93.86</b>	<b>0.45</b>	<b>0.08</b>
NTVC-05-10#1	2.06	51.21	20.23	26.50
NTVC-05-10#2	9.20	87.36	1.94	1.50
NTVC-05-10#3	10.05	87.99	0.48	1.48
NTVC-05-10#4	11.64	87.69	0.67	0.00
<b>NTVC-05-10 Composite</b>	<b>Vibracore outside of borrow area.</b>			
NTVC-05-11#1	4.83	95.15	0.02	0.00
NTVC-05-11#3	7.70	92.26	0.04	0.00
NTVC-05-11#2	8.30	91.69	0.01	0.00
<b>NTVC-05-11 Composite</b>	<b>5.92</b>	<b>94.05</b>	<b>0.03</b>	<b>0.00</b>
NTVC-05-12#1	5.12	94.88	0.00	0.00
NTVC-05-12#2	9.00	90.97	0.03	0.00
NTVC-05-12#3	9.23	90.77	0.00	0.00
<b>NTVC-05-12 Composite</b>	<b>5.28</b>	<b>94.73</b>	<b>0.00</b>	<b>0.00</b>
NTVC-05-13#1	2.50	37.21	21.45	38.84
NTVC-05-13#2	11.51	87.84	0.65	0.00
NTVC-05-13#3	13.71	85.17	0.65	0.47
NTVC-05-13#4	13.05	86.78	0.03	0.14
NTVC-05-13#5	14.10	85.68	0.15	0.07
<b>NTVC-05-13 Composite</b>	<b>8.88</b>	<b>73.07</b>	<b>6.72</b>	<b>11.33</b>
NTVC-05-14#1	2.87	97.13	0.00	0.00
NTVC-05-14#2	4.60	95.40	0.00	0.00
NTVC-05-14#3	6.40	93.60	0.00	0.00
NTVC-05-14#4	8.21	91.79	0.00	0.00
<b>NTVC-05-14a Composite</b>	<b>3.46</b>	<b>96.53</b>	<b>0.00</b>	<b>0.00</b>
NTVC-05-14#1	2.87	97.13	0.00	0.00
NTVC-05-14#2	4.60	95.40	0.00	0.00
NTVC-05-14#3	6.40	93.60	0.00	0.00
NTVC-05-14#4	8.21	91.79	0.00	0.00
<b>NTVC-05-14b Composite</b>	<b>2.90</b>	<b>97.09</b>	<b>0.00</b>	<b>0.00</b>
NTVC-05-15#1	1.79	97.92	0.29	0.00
NTVC-05-15#2	1.70	97.18	1.12	0.00
NTVC-05-15#3	9.00	91.00	0.00	0.00
NTVC-05-15#4	10.49	89.51	0.00	0.00
<b>NTVC-05-15 Composite</b>	<b>1.75</b>	<b>97.62</b>	<b>0.63</b>	<b>0.00</b>

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY NORTH TOPSAIL BEACH VIBRACORES (4 of 9)				
SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-05-15#1	1.79	97.92	0.29	0.00
NTVC-05-15#2	1.70	97.18	1.12	0.00
NTVC-05-16#5	12.76	87.01	0.23	0.00
NTVC-05-15#3	9.00	91.00	0.00	0.00
NTVC-05-15#4	10.49	89.51	0.00	0.00
<b>NTVC-05-15a Composite</b>	<b>4.95</b>	<b>94.66</b>	<b>0.39</b>	<b>0.00</b>
NTVC-05-15#1	1.79	97.92	0.29	0.00
NTVC-05-15#2	1.70	97.18	1.12	0.00
NTVC-05-15#3	9.00	91.00	0.00	0.00
NTVC-05-15#4	10.49	89.51	0.00	0.00
<b>NTVC-05-15b Composite</b>	<b>1.79</b>	<b>97.92</b>	<b>0.29</b>	<b>0.00</b>
NTVC-05-16#1	11.12	88.38	0.50	0.00
NTVC-05-16#2	2.83	77.03	10.03	10.11
NTVC-05-16#3	5.52	94.48	0.00	0.00
NTVC-05-16#4	10.10	89.87	0.03	0.00
NTVC-05-16#5	12.76	87.01	0.23	0.00
NTVC-05-16#6	30.65	68.65	0.70	0.00
<b>NTVC-05-16 Composite</b>	<b>5.83</b>	<b>90.95</b>	<b>1.63</b>	<b>1.57</b>
NTVC-05-17#1	3.67	81.33	5.67	9.33
NTVC-05-17#2	9.20	90.02	0.07	0.71
NTVC-05-17#3	16.54	83.38	0.08	0.00
NTVC-05-17#4	20.18	79.43	0.16	0.23
<b>NTVC-05-17 Composite</b>	<b>Vibracore outside of borrow area.</b>			
NTVC-05-18#1	14.57	85.43	0.00	0.00
NTVC-05-18#2	14.14	85.86	0.00	0.00
NTVC-05-18#3	17.08	82.18	0.74	0.00
<b>NTVC-05-18 Composite</b>	<b>Vibracore outside of borrow area.</b>			
NTVC-05-19#1	4.39	95.05	0.56	0.00
NTVC-05-19#2	3.75	96.22	0.03	0.00
NTVC-05-19#3	4.45	95.55	0.00	0.00
NTVC-05-19#4	5.95	93.97	0.08	0.00
<b>NTVC-05-19a Composite</b>	<b>4.75</b>	<b>95.07</b>	<b>0.17</b>	<b>0.00</b>
NTVC-05-19#1	4.39	95.05	0.56	0.00
NTVC-05-19#2	3.75	96.22	0.03	0.00
NTVC-05-19#3	4.45	95.55	0.00	0.00
NTVC-05-19#4	5.95	93.97	0.08	0.00
<b>NTVC-05-19b Composite</b>	<b>4.18</b>	<b>95.43</b>	<b>0.39</b>	<b>0.00</b>

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY NORTH TOPSAIL BEACH VIBRACORES (5 of 9)				
SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-05-20#1	1.34	96.74	1.50	0.42
NTVC-05-20#2	7.83	91.77	0.10	0.30
<b>NTVC-05-20 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-21#1	2.42	94.96	1.90	0.72
NTVC-05-21#2	8.43	90.64	0.34	0.59
NTVC-05-21#3	10.50	85.41	2.13	1.96
NTVC-05-21#4	13.08	86.67	0.25	0.00
<b>NTVC-05-21 Composite</b>	<b>8.13</b>	<b>90.15</b>	<b>0.87</b>	<b>0.87</b>
NTVC-05-22#1	1.43	74.06	17.37	7.14
NTVC-05-22#2	14.17	85.43	0.37	0.03
NTVC-05-22#3	14.88	84.75	0.37	0.00
NTVC-05-22#4	19.71	77.51	1.04	1.74
<b>NTVC-05-22 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-23#1	5.20	62.18	15.36	17.26
NTVC-05-23#2	3.58	96.40	0.02	0.00
NTVC-05-23#3	5.80	94.20	0.00	0.00
NTVC-05-23#4	7.77	92.19	0.00	0.04
NTVC-05-23#5	8.33	91.67	0.00	0.00
<b>NTVC-05-23 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-24#1	1.27	62.72	14.80	21.21
NTVC-05-24#2	12.50	81.85	3.90	1.75
NTVC-05-24#3	8.74	90.07	1.19	0.00
NTVC-05-24#4	5.54	94.41	0.05	0.00
<b>NTVC-05-24 Composite</b>	<b>9.16</b>	<b>85.17</b>	<b>3.22</b>	<b>2.45</b>
NTVC-05-25#1	1.90	55.29	10.87	31.94
NTVC-05-25#2	5.09	94.84	0.07	0.00
NTVC-05-25#3	9.76	89.78	0.46	0.00
NTVC-05-25#4	7.85	92.07	0.07	0.01
<b>NTVC-05-25 Composite</b>	<b>5.74</b>	<b>88.83</b>	<b>1.49</b>	<b>3.94</b>
NTVC-05-26#1	1.96	77.73	10.15	10.16
NTVC-05-26#2	7.41	92.52	0.07	0.00
NTVC-05-26#3	8.96	90.58	0.46	0.00
NTVC-05-26#4	19.48	78.48	1.76	0.28
NTVC-05-26#5	11.21	88.39	0.31	0.09
<b>NTVC-05-26 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-05-27#1	1.31	93.67	3.26	1.76
NTVC-05-27#2	9.36	90.56	0.08	0.00
NTVC-05-27#3	4.56	95.38	0.06	0.00
NTVC-05-27#4	4.33	95.65	0.02	0.00
NTVC-05-27#5	3.36	96.64	0.00	0.00
NTVC-05-27#6	4.38	95.62	0.00	0.00
<b>NTVC-05-27 Composite</b>		<b>Vibracore outside of borrow area.</b>		

**PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY**  
**NORTH TOPSAIL BEACH VIBRACORES (6 of 9)**

SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-06-01#1	2.35	89.67	5.67	2.31
NTVC-06-01#2	12.39	87.46	0.15	0.00
NTVC-06-01#3	11.92	31.78	15.09	41.21
NTVC-06-01#4	20.24	79.43	0.18	0.15
NTVC-06-01#5	23.63	76.04	0.33	0.00
NTVC-06-01#6	14.04	49.61	5.72	30.63
<b>NTVC-06-01 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-06-02#1	9.13	90.77	0.10	0.00
NTVC-06-02#2	11.64	88.26	0.10	0.00
NTVC-06-02#3	20.48	78.81	0.34	0.37
NTVC-06-02#4	15.18	27.28	10.15	47.39
NTVC-06-02#5	31.87	64.41	2.19	1.53
NTVC-06-02#6	23.25	76.53	0.22	0.00
<b>NTVC-06-02 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-06-03#1	4.25	80.99	11.02	3.74
NTVC-06-03#2	9.79	81.82	2.54	5.85
NTVC-06-03#3	4.05	39.17	7.87	48.91
NTVC-06-03#4	3.98	95.95	0.07	0.00
NTVC-06-03#5	2.65	97.34	0.01	0.00
NTVC-06-03#6	7.39	92.54	0.07	0.00
NTVC-06-03#7	19.56	80.01	0.31	0.12
<b>NTVC-06-03a Composite</b>	<b>3.52</b>	<b>90.36</b>	<b>1.18</b>	<b>4.94</b>
NTVC-06-03#1	4.25	80.99	11.02	3.74
NTVC-06-03#2	9.79	81.82	2.54	5.85
NTVC-06-03#3	4.05	39.17	7.87	48.91
NTVC-06-03#4	3.98	95.95	0.07	0.00
NTVC-06-03#5	2.65	97.34	0.01	0.00
NTVC-06-03#6	7.39	92.54	0.07	0.00
NTVC-06-03#7	19.56	80.01	0.31	0.12
<b>NTVC-06-03b Composite</b>	<b>4.58</b>	<b>90.96</b>	<b>0.87</b>	<b>3.59</b>
NTVC-06-04#1	16.18	79.03	3.07	1.72
NTVC-06-04#2	12.56	73.33	6.48	7.63
NTVC-06-04#3	5.52	94.08	0.40	0.00
NTVC-06-04#4	7.12	92.66	0.18	0.04
NTVC-06-04#5	12.58	87.06	0.33	0.03
NTVC-06-04#6	16.61	81.81	1.24	0.34
<b>NTVC-06-04 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-06-05#1	15.11	84.21	0.68	0.00
NTVC-06-05#2	14.55	78.93	1.55	4.97
NTVC-06-05#3	5.60	94.02	0.34	0.04
NTVC-06-05#4	17.12	82.75	0.13	0.00
NTVC-06-05#5	23.12	57.97	10.22	8.69
NTVC-06-05#6	27.49	69.51	1.89	1.11
<b>NTVC-06-05 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-06-06#1	5.72	94.03	0.25	0.00
NTVC-06-06#2	5.66	94.30	0.04	0.00
NTVC-06-06#3	9.36	90.39	0.07	0.18
NTVC-06-06#4	20.85	73.95	2.95	2.25
NTVC-06-06#5	18.38	81.05	0.33	0.24
<b>NTVC-06-06a Composite</b>	<b>6.15</b>	<b>93.68</b>	<b>0.15</b>	<b>0.02</b>
NTVC-06-06#1	5.72	94.03	0.25	0.00
NTVC-06-06#2	5.66	94.30	0.04	0.00
NTVC-06-06#3	9.36	90.39	0.07	0.18
NTVC-06-06#4	20.85	73.95	2.95	2.25
NTVC-06-06#5	18.38	81.05	0.33	0.24
<b>NTVC-06-06b Composite</b>	<b>6.84</b>	<b>92.98</b>	<b>0.13</b>	<b>0.06</b>

**PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY**  
**NORTH TOPSAIL BEACH VIBRACORES (7 of 9)**

SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-06-07#1	7.17	71.27	5.40	16.16
NTVC-06-07#2	7.25	92.48	0.27	0.00
NTVC-06-07#3	9.56	90.17	0.27	0.00
NTVC-06-07#4	9.50	89.98	0.44	0.08
NTVC-06-07#5	19.64	75.81	3.50	1.05
NTVC-06-07#6	10.75	39.76	15.80	33.69
NTVC-06-07#7	14.52	83.64	0.86	0.98
<b>NTVC-06-07a Composite</b>	<b>8.78</b>	<b>86.76</b>	<b>1.35</b>	<b>3.12</b>
NTVC-06-07#1	7.17	71.27	5.40	16.16
NTVC-06-07#2	7.25	92.48	0.27	0.00
NTVC-06-07#3	9.56	90.17	0.27	0.00
NTVC-06-07#4	9.50	89.98	0.44	0.08
NTVC-06-07#5	19.64	75.81	3.50	1.05
NTVC-06-07#6	10.75	39.76	15.80	33.69
NTVC-06-07#7	14.52	83.64	0.86	0.98
<b>NTVC-06-07b Composite</b>	<b>10.09</b>	<b>79.08</b>	<b>3.63</b>	<b>7.20</b>
NTVC-06-07#1	7.17	71.27	5.40	16.16
NTVC-06-07#2	7.25	92.48	0.27	0.00
NTVC-06-07#3	9.56	90.17	0.27	0.00
NTVC-06-07#4	9.50	89.98	0.44	0.08
NTVC-06-07#5	19.64	75.81	3.50	1.05
NTVC-06-07#6	10.75	39.76	15.80	33.69
NTVC-06-07#7	14.52	83.64	0.86	0.98
<b>NTVC-06-07c Composite</b>	<b>8.92</b>	<b>87.41</b>	<b>1.17</b>	<b>2.50</b>
NTVC-06-08#1	15.54	78.48	2.83	3.15
NTVC-06-08#2	7.94	88.68	0.94	2.44
NTVC-06-08#3	7.64	92.00	0.36	0.00
NTVC-06-08#4	15.68	83.33	0.77	0.22
<b>NTVC-06-08 Composite</b>		<b>Vibracore outside of borrow area.</b>		
NTVC-06-09#1	6.08	73.79	6.77	13.36
NTVC-06-09#2	7.95	91.16	0.77	0.12
NTVC-06-09#3	9.70	89.64	0.57	0.09
NTVC-06-09#4	7.44	92.56	0.00	0.00
NTVC-06-09#5	5.63	94.31	0.06	0.00
<b>NTVC-06-09 Composite</b>	<b>7.41</b>	<b>91.66</b>	<b>0.47</b>	<b>0.45</b>
NTVC-06-10#1	1.27	78.03	8.34	12.36
NTVC-06-10#2	9.32	90.00	0.68	0.00
NTVC-06-10#3	7.14	92.81	0.05	0.00
NTVC-06-10#4	13.56	94.69	0.02	0.00
<b>NTVC-06-10a Composite</b>	<b>7.12</b>	<b>90.02</b>	<b>1.30</b>	<b>1.56</b>
NTVC-06-10#1	1.27	78.03	8.34	12.36
NTVC-06-10#2	9.32	90.00	0.68	0.00
NTVC-06-10#3	7.14	92.81	0.05	0.00
NTVC-06-10#4	13.56	94.69	0.02	0.00
<b>NTVC-06-10b Composite</b>	<b>6.83</b>	<b>91.10</b>	<b>0.95</b>	<b>1.12</b>

**PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY**  
**NORTH TOPSAIL BEACH VIBRACORES (8 of 9)**

SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-06-11#1	7.62	92.03	0.35	0.00
NTVC-06-11#2	14.95	84.80	0.25	0.00
NTVC-06-11#3	24.15	73.62	1.75	0.48
<b>NTVC-06-11a Composite</b>	<b>7.62</b>	<b>92.03</b>	<b>0.35</b>	<b>0.00</b>
NTVC-06-11#1	7.62	92.03	0.35	0.00
NTVC-06-11#2	14.95	84.80	0.25	0.00
NTVC-06-11#3	24.15	73.62	1.75	0.48
<b>NTVC-06-11b Composite</b>	<b>7.43</b>	<b>91.23</b>	<b>0.34</b>	<b>0.00</b>
NTVC-06-12#1	9.97	76.24	9.70	4.09
NTVC-06-12#2	8.53	91.12	0.35	0.00
NTVC-06-12#3	6.59	93.13	0.28	0.00
NTVC-06-12#4	8.72	90.21	0.64	0.43
NTVC-06-12#5	7.59	42.93	21.33	28.15
NTVC-06-12#6	17.53	80.51	1.64	0.32
<b>NTVC-06-12a Composite</b>	<b>8.39</b>	<b>90.66</b>	<b>0.76</b>	<b>0.18</b>
NTVC-06-12#1	9.97	76.24	9.70	4.09
NTVC-06-12#2	8.53	91.12	0.35	0.00
NTVC-06-12#3	6.59	93.13	0.28	0.00
NTVC-06-12#4	8.72	90.21	0.64	0.43
NTVC-06-12#5	7.59	42.93	21.33	28.15
NTVC-06-12#6	17.53	80.51	1.64	0.32
<b>NTVC-06-12b Composite</b>	<b>7.92</b>	<b>91.31</b>	<b>0.62</b>	<b>0.15</b>
NTVC-06-12#1	9.97	76.24	9.70	4.09
NTVC-06-12#2	8.53	91.12	0.35	0.00
NTVC-06-12#3	6.59	93.13	0.28	0.00
NTVC-06-12#4	8.72	90.21	0.64	0.43
NTVC-06-12#5	7.59	42.93	21.33	28.15
NTVC-06-12#6	17.53	80.51	1.64	0.32
<b>NTVC-06-12c Composite</b>	<b>8.16</b>	<b>90.98</b>	<b>0.70</b>	<b>0.16</b>
NTVC-06-13#1	9.53	86.16	3.28	1.03
NTVC-06-13#2	5.07	69.23	7.58	18.12
NTVC-06-13#3	11.82	85.43	2.48	0.27
NTVC-06-13#4	7.63	50.51	5.67	36.19
NTVC-06-13#5	4.81	95.01	0.18	0.00
NTVC-06-13#6	11.09	87.64	0.74	0.53
<b>NTVC-06-13a Composite</b>	<b>10.71</b>	<b>81.37</b>	<b>3.29</b>	<b>4.63</b>
NTVC-06-13#1	9.53	86.16	3.28	1.03
NTVC-06-13#2	5.07	69.23	7.58	18.12
NTVC-06-13#3	11.82	85.43	2.48	0.27
NTVC-06-13#4	7.63	50.51	5.67	36.19
NTVC-06-13#5	4.81	95.01	0.18	0.00
NTVC-06-13#6	11.09	87.64	0.74	0.53
<b>NTVC-06-13b Composite</b>	<b>8.76</b>	<b>83.54</b>	<b>2.51</b>	<b>5.20</b>
NTVC-06-13#1	9.53	86.16	3.28	1.03
NTVC-06-13#2	5.07	69.23	7.58	18.12
NTVC-06-13#3	11.82	85.43	2.48	0.27
NTVC-06-13#4	7.63	50.51	5.67	36.19
NTVC-06-13#5	4.81	95.01	0.18	0.00
NTVC-06-13#6	11.09	87.64	0.74	0.53
<b>NTVC-06-13c Composite</b>	<b>8.97</b>	<b>82.92</b>	<b>2.63</b>	<b>5.48</b>

PERCENTAGE OF MATERIAL BY SEDIMENT GRAIN SIZE CATEGORY NORTH TOPSAIL BEACH VIBRACORES (9 of 9)				
SAMPLE I.D.	Fine % (<0.0625mm)	Sand % (0.0625mm-2.00mm)	Granular % (2mm-4.76mm)	Gravel % (4.76mm-76mm)
NTVC-06-14#1	10.37	88.42	1.21	0.00
NTVC-06-14#2	6.48	92.99	0.53	0.00
NTVC-06-14#3	6.69	92.15	0.36	0.80
NTVC-06-14#4	10.22	89.21	0.46	0.11
NTVC-06-14#5	20.91	74.09	4.08	0.92
<b>NTVC-06-14 Composite</b>	<b>7.82</b>	<b>91.31</b>	<b>0.67</b>	<b>0.20</b>
NTVC-06-15#1	1.49	94.22	1.87	2.42
NTVC-06-15#2	1.83	71.35	11.19	15.63
NTVC-06-15#3	3.98	90.90	2.83	2.29
NTVC-06-15#4	8.96	71.13	5.46	14.45
NTVC-06-15#5	9.71	89.68	0.61	0.00
NTVC-06-15#6	10.17	89.33	0.44	0.06
NTVC-06-15#7	18.52	71.55	6.50	3.43
<b>NTVC-06-15 Composite</b>	<b>Vibracore outside of borrow area.</b>			
NTVC-06-16#1	2.13	80.80	4.73	12.34
NTVC-06-16#2	11.29	88.39	0.32	0.00
NTVC-06-16#3	17.98	74.17	6.28	1.57
NTVC-06-16#4	8.64	89.97	1.26	0.13
NTVC-06-16#5	12.11	87.46	0.28	0.15
<b>NTVC-06-16 Composite</b>	<b>Vibracore outside of borrow area.</b>			
NTVC-06-17#1	12.54	85.11	1.74	0.61
NTVC-06-17#2	10.18	78.56	4.98	6.28
NTVC-06-17#3	7.99	91.13	0.88	0.00
NTVC-06-17#4	6.65	90.34	2.09	0.92
NTVC-06-17#5	12.83	78.26	3.45	5.46
<b>NTVC-06-17a Composite</b>	<b>11.02</b>	<b>83.78</b>	<b>2.73</b>	<b>2.47</b>
NTVC-06-17#1	12.54	85.11	1.74	0.61
NTVC-06-17#2	10.18	78.56	4.98	6.28
NTVC-06-17#3	7.99	91.13	0.88	0.00
NTVC-06-17#4	6.65	90.34	2.09	0.92
NTVC-06-17#5	12.83	78.26	3.45	5.46
<b>NTVC-06-17b Composite</b>	<b>10.85</b>	<b>84.19</b>	<b>2.62</b>	<b>2.33</b>
NTVC-06-18#1	9.55	83.73	5.93	0.79
NTVC-06-18#2	10.44	64.25	9.00	16.31
NTVC-06-18#3	3.26	96.74	0.00	0.00
NTVC-06-18#4	12.34	87.04	0.44	0.18
NTVC-06-18#5	17.13	80.77	1.65	0.45
<b>NTVC-06-18a Composite</b>	<b>6.42</b>	<b>87.93</b>	<b>3.27</b>	<b>2.38</b>
NTVC-06-18#1	9.55	83.73	5.93	0.79
NTVC-06-18#2	10.44	64.25	9.00	16.31
NTVC-06-18#3	3.26	96.74	0.00	0.00
NTVC-06-18#4	12.34	87.04	0.44	0.18
NTVC-06-18#5	17.13	80.77	1.65	0.45
<b>NTVC-06-18b Composite</b>	<b>7.34</b>	<b>88.91</b>	<b>2.19</b>	<b>1.57</b>
<b>Fine BA Composite</b>	<b>6.40</b>	<b>91.04</b>	<b>1.13</b>	<b>1.43</b>
<b>Coarse BA Composite</b>	<b>1.75</b>	<b>97.62</b>	<b>0.63</b>	<b>0.00</b>

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (1 OF 9)																										
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																				PAN
						GRAVEL				GRANULAR				SAND												
NTVC-05-01#1	1.0	0.19	2.42	0.51	7.64	0.00	0.00	0.00	0.00	0.06	0.09	0.09	0.15	0.62	1.15	2.07	2.87	8.96	49.84	87.66	91.62	92.01	92.36	99.83		
NTVC-05-01#2	1.9	0.17	2.53	0.74	13.46	0.00	0.00	0.00	0.00	0.15	0.15	0.36	0.96	1.53	1.96	2.37	2.56	2.98	3.16	4.50	25.31	79.81	85.76	86.13	86.54	99.58
NTVC-05-08#1	0.0	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	98.94	99.99
NTVC-05-01#3	0.0	0.15	2.76	0.58	18.85	0.00	0.00	0.00	0.00	0.14	0.14	0.41	0.68	0.93	1.13	1.35	1.53	1.73	1.94	6.56	64.73	79.60	80.71	81.15	99.09	
NTVC-05-01#4	0.0	0.15	2.75	0.59	15.70	0.00	0.00	0.00	0.00	0.27	0.27	0.49	0.70	0.89	1.08	1.26	1.54	1.75	2.35	6.37	69.20	82.57	83.84	84.30	99.91	
NTVC-05-01#5	0.0	0.14	2.80	0.54	15.60	0.00	0.00	0.00	0.00	0.35	0.41	0.72	0.93	1.10	1.15	1.16	1.18	1.25	2.47	66.91	82.24	83.80	84.40	99.18		
NTVC-05-01 Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-05-02#1	1.4	0.30	1.72	1.33	1.30	0.00	0.00	0.00	1.43	2.07	2.24	2.92	4.45	6.17	8.43	10.71	13.72	19.64	26.48	40.34	70.43	95.14	98.05	98.56	98.70	99.99
NTVC-05-02#2	4.4	0.15	2.73	0.44	5.81	0.00	0.00	0.00	0.00	0.00	0.14	0.24	0.38	0.58	0.78	1.14	1.59	2.66	9.90	82.15	92.84	93.80	94.19	99.90		
NTVC-05-02#3	2.1	0.14	2.80	0.29	7.60	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.05	0.09	0.19	0.34	0.79	5.40	78.23	90.83	91.92	92.40	99.82		
NTVC-05-02#4	0.0	0.14	2.87	0.26	10.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.14	1.25	67.82	87.81	88.98	89.56	99.13	
NTVC-05-02#5	0.0	0.13	2.90	0.27	10.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.16	0.62	63.73	86.95	88.83	89.48	99.16		
Cut to -42.0																										
NTVC-05-02 Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-05-03#1	0.0	0.27	1.88	0.72	2.04	0.00	0.00	0.00	0.00	0.00	0.08	0.11	0.35	1.06	4.19	13.38	25.03	46.98	81.30	96.34	97.79	97.93	97.96	99.79		
NTVC-05-03#2	0.0	0.15	2.74	0.49	16.84	0.00	0.00	0.00	0.00	0.00	0.25	0.60	0.76	0.79	0.94	1.07	1.25	1.60	7.69	71.53	82.02	83.15	83.16	99.88		
NTVC-05-03 Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-05-04#1	0.0	0.20	2.35	0.75	14.75	0.00	0.00	0.03	0.15	0.43	0.55	0.73	1.04	1.46	1.88	2.54	3.66	5.74	12.10	44.63	80.27	84.60	85.20	85.25	99.62	
NTVC-05-04#2	0.0	0.19	2.43	0.41	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.11	0.15	0.48	1.36	9.84	54.51	93.34	97.33	97.62	97.77	99.79	
NTVC-05-04#3	0.0	0.18	2.51	0.38	1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.26	0.79	5.59	46.93	91.62	97.39	97.87	98.01	99.94		
NTVC-05-04#4	0.0	0.19	2.43	0.41	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.11	0.15	0.48	1.36	9.84	54.51	93.34	97.33	97.62	97.77	99.79	
NTVC-05-04#5	0.0	0.16	2.64	0.60	7.50	0.00	0.00	0.00	0.45	0.45	0.45	0.47	0.59	0.76	1.02	1.25	1.45	2.33	2.63	23.36	80.09	90.93	92.08	92.50	99.88	
NTVC-05-04#6	0.0	0.16	2.66	0.50	15.45	0.00	0.00	0.00	0.00	0.07	0.08	0.20	0.30	0.58	0.80	0.97	1.18	1.38	1.88	18.29	76.06	83.34	84.06	84.55	99.84	
NTVC-05-04#7	0.0	0.18	2.50	0.77	19.89	0.00	0.00	0.00	0.43	0.43	0.50	0.63	0.83	1.07	1.42	1.77	2.48	3.14	3.67	4.90	25.12	74.17	79.87	79.95	80.11	99.74
NTVC-05-04 Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-05-08#1	0.4	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	98.94	99.99
NTVC-05-05#1	3.3	0.18	2.48	0.47	6.58	0.00	0.00	0.00	0.00	0.00	0.01	0.07	0.15	0.28	0.67	1.29	6.11	56.68	81.57	90.71	93.13	93.42	99.89			
NTVC-05-05#2	1.4	0.18	2.49	0.43	5.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12	0.13	0.15	0.20	0.21	0.38	0.72	5.73	49.04	90.39	91.91	94.74	95.00	99.89	
NTVC-05-05#3	0.0	0.15	2.69	0.32	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.32	1.21	20.19	83.60	92.03	93.09	93.50	99.95			
NTVC-05-05#4	0.0	0.14	2.79	0.27	8.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.22	0.57	6.44	77.42	89.83	90.93	91.38	99.89				
Cut to -43.0																										
NTVC-05-05a Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-05-08#1	0.4	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	98.94	99.99
NTVC-05-05#1	3.3	0.18	2.48	0.47	6.58	0.00	0.00	0.00	0.00	0.00	0.01	0.07	0.15	0.28	0.67	1.29	6.11	56.68	81.57	90.71	93.13	93.42	99.89			
NTVC-05-05#2	4.4	0.18	2.49	0.43	5.00	0.00	0.00	0.00	0.00	0.00	0.12	0.12	0.13	0.15	0.20	0.21	0.38	0.72	5.73	49.04	90.39	91.91	94.74	95.00	99.89	
NTVC-05-05#3	0.0	0.15	2.69	0.32	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.32	1.21	20.19	83.60	92.03	93.09	93.50	99.95			
NTVC-05-05#4	0.0	0.14	2.79	0.27	8.62	0.00	0.00	0.00	0.0																	

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (2 OF 9)																											
SAMPLE I.D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																				PAN	
						GRAVEL							GRANULAR							SAND							
						-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0		
NTVC-05-06#1	1.9	0.24	2.05	0.98	1.62	0.00	0.00	0.00	0.00	0.55	0.69	1.39	2.13	2.73	3.65	4.78	6.62	9.57	14.74	28.03	67.32	95.29	98.09	98.30	98.38	99.99	
NTVC-05-06#2	4.5	0.18	2.45	0.58	7.91	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.24	0.63	1.13	1.74	2.53	3.31	6.80	46.62	87.23	87.59	91.79	92.09	99.84	
NTVC-05-06#3	0.0	0.20	2.31	1.38	13.56	0.00	0.00	3.15	3.15	3.37	3.37	3.37	3.85	4.10	4.79	5.21	5.81	6.62	7.33	8.71	23.84	79.80	85.43	86.12	86.44	99.74	
Cut to -44.0																											
NTVC-05-06a Composite	6.4	0.20	2.33	0.75	6.05	0.00	0.00	0.00	0.00	0.16	0.20	0.45	0.67	0.98	1.53	2.21	3.19	4.62	6.70	13.10	52.77	89.62	90.71	93.72	93.96	99.88	
NTVC-05-06#1	1.9	0.24	2.05	0.98	1.62	0.00	0.00	0.00	0.00	0.55	0.69	1.39	2.13	2.73	3.65	4.78	6.62	9.57	14.74	28.03	67.32	95.29	98.09	98.30	98.38	99.99	
NTVC-05-06#2	7.5	0.18	2.45	0.58	7.91	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.24	0.63	1.13	1.74	2.53	3.31	6.80	46.62	87.23	87.59	91.79	92.09	99.84	
NTVC-05-06#3	0.0	0.20	2.31	1.38	13.56	0.00	0.00	3.15	3.15	3.37	3.37	3.37	3.85	4.10	4.79	5.21	5.81	6.62	7.33	8.71	23.84	79.80	85.43	86.12	86.44	99.74	
Cut to -47.0																											
NTVC-05-06b Composite	9.4	0.19	2.37	0.70	6.63	0.00	0.00	0.00	0.00	0.11	0.14	0.32	0.47	0.74	1.24	1.87	2.73	3.95	5.62	11.09	50.80	88.86	89.71	93.11	93.36	99.87	
NTVC-05-06#1	1.9	0.24	2.05	0.98	1.62	0.00	0.00	0.00	0.00	0.55	0.69	1.39	2.13	2.73	3.65	4.78	6.62	9.57	14.74	28.03	67.32	95.29	98.09	98.30	98.38	99.99	
NTVC-05-06#2	6.5	0.18	2.45	0.58	7.91	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.24	0.63	1.13	1.74	2.53	3.31	6.80	46.62	87.23	87.59	91.79	92.09	99.84	
NTVC-05-06#3	0.0	0.20	2.31	1.38	13.56	0.00	0.00	3.15	3.15	3.37	3.37	3.37	3.85	4.10	4.79	5.21	5.81	6.62	7.33	8.71	23.84	79.80	85.43	86.12	86.44	99.74	
Cut to -46.0																											
NTVC-05-06c Composite	8.4	0.19	2.36	0.72	6.49	0.00	0.00	0.00	0.00	0.12	0.16	0.35	0.52	0.80	1.31	1.96	2.84	4.12	5.90	11.60	51.30	89.05	89.97	93.26	93.51	99.87	
NTVC-05-07#1	1.1	0.21	2.22	0.77	1.55	0.00	0.00	0.00	0.00	0.10	0.24	0.45	0.65	1.06	1.70	2.48	3.89	6.18	10.09	21.48	61.18	94.25	97.99	98.45	99.99		
NTVC-05-07#2	3.3	0.19	2.36	0.43	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.19	0.47	1.01	2.62	10.50	64.66	92.98	95.66	96.36	96.62	99.88			
NTVC-05-07#3	5.2	0.17	2.54	0.36	3.56	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.09	0.15	0.34	3.05	4.86	90.26	95.43	96.06	96.44	99.88			
NTVC-05-07#4	0.8	0.16	2.62	0.35	6.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.19	1.83	3.24	44.66	92.68	93.47	93.85	99.92				
Cut to -47.5																											
NTVC-05-07a Composite	10.4	0.18	2.45	0.46	3.49	0.00	0.00	0.00	0.01	0.03	0.05	0.07	0.12	0.20	0.34	0.61	1.05	2.08	7.27	51.91	91.11	95.56	96.20	96.51	99.90		
NTVC-05-07#1	1.1	0.21	2.22	0.77	1.55	0.00	0.00	0.00	0.00	0.10	0.24	0.45	0.65	1.06	1.70	2.48	3.89	6.18	10.09	21.48	61.18	94.25	97.99	98.33	98.45	99.99	
NTVC-05-07#2	3.3	0.19	2.36	0.43	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.19	0.47	1.01	2.62	10.50	64.66	92.98	95.66	96.36	96.62	99.88			
NTVC-05-07#3	3.3	0.17	2.54	0.36	3.56	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.09	0.15	0.34	3.05	4.86	90.26	95.43	96.06	96.44	99.88			
NTVC-05-07#4	0.0	0.16	2.62	0.35	6.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.06	0.19	1.83	3.24	44.66	92.68	93.47	93.85	99.92					
Cut to -45.0																											
NTVC-05-07b Composite	7.7	0.19	2.42	0.48	3.20	0.00	0.00	0.00	0.01	0.03	0.06	0.09	0.16	0.26	0.45	0.80	1.38	2.71	8.88	55.68	92.00	95.89	96.51	96.80	99.90		
NTVC-05-08#1	0.8	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	99.84	99.99	
NTVC-05-08#2	4.2	0.18	2.48	0.50	4.91	0.00	0.00	0.00	0.00	0.00	0.02	0.17	0.33	0.54	0.81	1.26	1.80	6.50	50.29	89.65	89.93	94.86	95.09	99.89			
NTVC-05-08#3	1.5	0.17	2.53	0.48	7.70	0.00	0.00	0.00	0.00	0.00	0.08	0.21	0.56	0.66	0.80	0.99	1.27	4.69	38.81	85.04	91.22	91.96	92.30	99.91			
NTVC-05-08#4	0.0	0.18	2.50	0.85	9.31	0.00	0.00	0.00	0.00	0.43	0.64	0.83	1.67	2.33	2.72	2.92	3.14	3.45	3.94	5.81	28.41	81.35	89.53	90.30	90.69	99.92	
Cut to -45.0																											
NTVC-05-08a Composite	6.5	0.24	2.03	1.43	5.08	0.00	0.00	1.19	2.08	3.02	3.59	4.19	5.40	6.72	8.10	9.06	10.11	11.60	12.57	16.72	53.29	89.66	91.31	94.68	94.91	99.91	
NTVC-05-08#1	0.8	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	99.84	99.99	
NTVC-05-08#2	4.2	0.18	2.48	0.50	4.91	0.00	0.00	0.00	0.00	0.00	0.02	0.17	0.33	0.54	0.81	1.26	1.80	6.50	50.29	89.65	89.93	94.86	95.09	99.89			
NTVC-05-08#3	3.8	0.17	2.53	0.48	7.70	0.00	0.00	0.00	0.00	0.00	0.08	0.21	0.56	0.66	0.80	0.99	1.27	4.69	38.81	85.04	91.22	91.96	92.30	99.91			
NTVC-05-08#4	0.0	0.18	2.50	0.85	9.31	0.00	0.00	0.00	0.00	0.43	0.64	0.83	1.67	2.33	2.72	2.92	3.14	3.45	3.94	5.81	28.41	81.35	89.53	90.30	90.69	99.92	
Cut to -46.0																											
NTVC-05-08b Composite	8.5	0.23	2.15	1.29	5.70	0.00	0.00	0.91	1.59	2.31	2.74	3.20	4.15	5.19	6.33	7.09	7.92	9.10	9.91	13.89	49.88	88.58	91.29	94.04	94.29	99.91	
NTVC-05-08#1	0.8	2.10	-1.07	1.78	1.16	0.00	0.00	9.65	16.94	24.54	29.15	34.05	43.66	53.35	63.07	69.57	76.40	85.76	90.34	92.91	96.19	98.41	98.74	98.82	99.84	99.99	
NTVC-05-08#2	4.2	0.18	2.48	0.50	4.91	0.00	0.00	0.00	0.00	0.00	0.02	0.17	0.33	0.54	0.81	1.26	1.80	6.50	50.29	89.65	89.93	94.86	95.09	99.89			
NTVC-05-08#3	3.8	0.17	2.53	0.48	7.70	0.00	0.00	0.00	0.00	0.00	0.08	0.21	0.56	0.66	0.80	0.99	1.27	4.69	38.81	85.04	91.22	91.96	92.30	99.91			
NTVC-05-08#4	0.7	0.18	2.50	0.85	9.31	0.00	0.00	0.00	0.00	0.43	0.64	0.83	1.67	2.33	2.72	2.92	3.14	3.45	3.94	5.81	28.41	81.35	89.53	90.30	90.69	99.92	

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (3 OF 9)																														
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																								
						GRAVEL							GRANULAR					SAND							PAN					
NTVC-05-09#1	1.2	0.21	2.26	0.95	7.42	0.00	0.00	0.00	0.42	0.52	0.52	0.73	1.40	2.42	3.57	4.01	4.63	5.88	7.30	13.09	60.13	85.34	85.52	92.21	92.58	99.83				
NTVC-05-09#2	4.3	0.19	2.40	0.41	5.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.14	0.25	0.32	0.44	0.76	1.58	6.95	59.07	91.53	94.04	94.44	94.59	99.94				
NTVC-05-09#3	1.9	0.18	2.45	0.43	4.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.24	0.29	0.53	0.62	0.76	1.20	5.64	52.25	91.25	94.55	94.98	95.12	100.00				
NTVC-05-09#4	0.0	0.20	2.35	1.08	8.32	0.00	0.00	0.30	0.34	0.87	1.08	1.60	2.62	3.43	4.50	5.28	6.07	6.67	7.15	9.38	34.86	83.29	90.46	91.27	91.68	99.84				
NTVC-05-09#4 Cut to -45																														
NTVC-05-09 Composite	7.4	0.19	2.39	0.54	5.62	0.00	0.00	0.00	0.07	0.08	0.08	0.12	0.26	0.54	0.80	0.97	1.17	1.59	2.41	7.61	57.49	90.45	92.79	94.22	94.40	99.94				
NTVC-05-10#1	0.7	1.68	-0.75	2.00	2.06	0.00	2.56	9.32	14.77	24.36	26.50	30.52	38.55	46.73	55.87	61.79	69.22	76.40	80.78	84.88	92.65	97.26	97.82	97.93	97.94	99.76				
NTVC-05-10#2	1.3	0.27	1.88	1.13	9.20	0.00	0.00	0.00	0.92	0.92	1.50	1.97	2.58	3.44	4.84	6.17	9.04	13.83	18.45	29.58	69.96	88.37	90.19	90.58	90.80	99.77				
NTVC-05-10#3	2.3	0.19	2.37	0.96	10.05	0.00	0.00	1.48	1.48	1.48	1.48	1.78	1.96	2.16	2.43	2.74	3.19	3.99	6.87	43.58	84.36	89.22	89.69	89.95	99.78					
NTVC-05-10#4	0.0	0.18	2.50	0.56	11.64	0.00	0.00	0.00	0.00	0.00	0.26	0.67	0.97	1.09	1.35	1.63	2.13	4.64	38.92	81.90	87.51	88.09	88.36	99.57						
NTVC-05-10 Composite																														
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																														
NTVC-05-11#1	5.7	0.17	2.59	0.44	4.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.07	0.09	0.12	0.35	0.86	4.75	36.72	88.06	88.10	94.82	95.17	99.83			
NTVC-05-11#3	3.5	0.14	2.83	0.27	7.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.06	0.10	0.16	0.34	2.50	75.10	90.54	91.87	92.30	99.91				
NTVC-05-11#2	0.0	0.14	2.85	0.28	8.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.07	0.11	0.16	0.22	0.34	1.82	72.48	89.31	90.91	91.70	99.61					
NTVC-05-11#2 Cut to -46.0																														
NTVC-05-11 Composite	9.2	0.16	2.68	0.40	5.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.07	0.10	0.25	0.59	3.07	23.70	83.13	89.03	93.70	94.08	99.86				
NTVC-05-12#1	7.5	0.18	2.50	0.36	5.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.12	0.30	0.56	4.32	47.70	90.30	94.20	94.60	94.88	99.90						
NTVC-05-12#2	0.3	0.14	2.82	0.26	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.04	0.07	0.14	0.34	3.05	76.18	89.21	90.35	91.00	93.58						
NTVC-05-12#3	0.0	0.14	2.84	0.24	9.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.07	0.15	0.28	0.57	2.77	68.03	84.28	85.51	85.90	99.86						
NTVC-05-12#3 Cut to -46.0																														
NTVC-05-12 Composite	7.8	0.18	2.51	0.36	5.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.12	0.29	0.54	4.17	45.98	89.76	94.01	94.44	94.73	99.89						
NTVC-05-13#1	0.7	2.43	-1.28	2.16	2.50	0.00	7.25	15.34	26.75	35.66	38.84	43.25	51.75	60.29	66.90	72.36	76.84	79.47	81.29	83.48	89.35	95.78	97.26	97.49	97.50	99.87				
NTVC-05-13#2	1.7	0.18	2.44	0.63	11.51	0.00	0.00	0.00	0.00	0.00	0.10	0.26	0.65	1.27	1.68	2.09	2.49	2.96	7.15	42.53	82.62	87.59	88.20	88.49	99.74					
NTVC-05-13#3	0.0	0.15	2.72	0.73	13.71	0.00	0.00	0.00	0.00	0.00	0.41	0.47	0.56	0.94	1.12	1.47	1.73	1.89	2.15	2.31	2.81	9.56	73.80	76.81	85.98	86.29				
NTVC-05-13#4	0.0	0.14	2.82	0.39	13.05	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.14	0.17	0.29	0.36	0.48	0.62	0.68	0.88	3.13	69.97	85.41	86.53	86.95	99.89				
NTVC-05-13#5	0.0	0.14	2.82	0.39	14.10	0.00	0.00	0.00	0.00	0.00	0.07	0.12	0.15	0.22	0.27	0.34	0.43	0.57	0.66	0.87	2.77	68.03	84.28	85.51	85.90	99.84				
NTVC-05-13#5 Cut to -40.0																														
NTVC-05-13 Composite	2.4	0.41	1.28	2.17	8.88	0.00	2.11	4.47	7.80	10.40	11.33	12.69	15.28	18.05	20.41	22.30	23.89	24.94	25.81	29.41	56.19	86.46	90.41	90.91	91.12	99.78				
NTVC-05-14#1	4.0	0.22	2.20	0.59	2.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.56	2.35	4.69	8.78	21.86	72.86	93.18	96.24	96.78	97.13	99.94						
NTVC-05-14#2	2.1	0.16	2.62	0.36	4.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.09	0.30	0.61	3.52	29.12	87.82	94.48	94.96	95.40	99.90						
NTVC-05-14#3	0.0	0.14	2.80	0.26	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.12	0.38	0.57	5.07	79.98	91.96	93.01	93.60	99.75						
NTVC-05-14#4	0.0	0.13	2.90	0.35	8.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.19	0.39	1.92	73.91	76.09	91.29	91.79	99.88						
NTVC-05-14#4 Cut to -40.0																														
NTVC-05-14b Composite	4.1	0.22	2.21	0.58	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.55	2.29	4.58	8.58	21.41	71.79	93.05	96.20	96.74	97.09	99.94						
NTVC-05-14#1	4.0	0.22	2.20	0.59	2.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.56	2.35	4.69	8.78	21.86	72.86	93.18	96.24	96.78	97.13	99.94						
NTVC-05-14#2	0.1	0.16	2.62	0.36	4.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.09	0.30	0.61	3.52	29.12	87.82	94.48	94.96	95.40	99.90						
NTVC-05-14#3	0.0	0.14	2.80	0.26	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.12	0.38	0.57	5.07	79.98	91.96	93.01	93.60	99.75							
NTVC-05-14#4	0.0	0.13	2.90	0.35	8.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.09	0.19	0.39	1.92	73.91	76.09	91.29	91.79	99.88							
NTVC-05-14b Composite	4.1	0.22	2.21	0.58	2.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.55	2.29	4.58	8.58	21.41	71.79	93.05	96.20	96.74	97.09	99.94						
NTVC-05-15#1	5.0	0.33	1.62	0.51	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.17	0.29	0.51	0.91	2.04	7.07	34.30	82.44	95.41	97.86	98.15	98.21	99.96				
NTVC-05-15#2	3.5	0.34	1.56	0.63	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.50	1.12	1.45	1.95	2.												

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (4 OF 9)																															
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																									
						GRAVEL							GRANULAR							SAND							4.0				PAN
NTVC-05-15#1	5.0	0.33	1.62	0.51	1.79	0.00	0.00	0.00	0.00	0.00	0.12	0.17	0.29	0.51	0.91	2.04	7.07	34.30	82.44	95.41	97.86	98.15	98.20	98.21	99.96						
NTVC-05-15#2	4.2	0.34	1.56	0.63	1.70	0.00	0.00	0.00	0.00	0.00	0.37	0.50	1.12	1.45	1.95	2.99	9.27	42.98	81.96	92.64	97.67	98.21	98.25	98.30	100.00						
NTVC-05-16#5	0.5	0.13	2.89	0.44	12.76	0.00	0.00	0.00	0.00	0.00	0.14	0.23	0.33	0.45	0.58	0.71	0.83	1.15	4.79	55.08	84.72	86.79	87.24	100.00							
NTVC-05-15#3	6.3	0.14	2.80	0.32	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.18	0.75	1.90	6.29	73.87	89.45	90.59	91.00	99.94								
NTVC-05-15#4	0.0	0.14	2.82	0.27	10.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cut to -53.5																															
NTVC-05-15a Composite	16.0	0.24	2.08	0.77	4.95	0.00	0.00	0.00	0.00	0.00	0.13	0.19	0.39	0.56	0.82	1.46	4.74	22.32	48.06	56.76	87.03	94.32	94.86	95.05	99.96						
NTVC-05-15#1	4.5	0.33	1.62	0.51	1.79	0.00	0.00	0.00	0.00	0.00	0.12	0.17	0.29	0.51	0.91	2.04	7.07	34.30	82.44	95.41	97.86	98.15	98.20	98.21	99.96						
NTVC-05-15#2	0.0	0.34	1.56	0.63	1.70	0.00	0.00	0.00	0.00	0.00	0.37	0.50	1.12	1.45	1.95	2.99	9.27	42.98	81.96	92.64	97.67	98.21	98.25	98.30	100.00						
NTVC-05-15#3	0.0	0.14	2.80	0.32	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.18	0.75	1.90	6.29	73.87	89.45	90.59	91.00	99.94								
NTVC-05-15#4	0.0	0.14	2.82	0.27	10.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Cut to -42.0																															
NTVC-05-15b Composite	4.5	0.33	1.62	0.51	1.79	0.00	0.00	0.00	0.00	0.00	0.12	0.17	0.29	0.51	0.91	2.04	7.07	34.30	82.44	95.41	97.86	98.15	98.20	98.21	99.96						
NTVC-05-16#1	0.6	0.23	2.12	0.74	11.12	0.00	0.00	0.00	0.00	0.00	0.28	0.50	1.07	2.01	3.22	6.76	12.72	28.33	61.63	85.73	88.26	88.60	88.88	99.84							
NTVC-05-16#2	0.7	0.63	0.66	1.84	2.83	0.00	0.00	1.96	4.98	8.52	10.11	11.63	15.86	20.14	25.43	30.13	35.74	43.82	53.24	73.74	89.34	92.78	93.12	97.10	97.17	99.97					
NTVC-05-16#3	3.2	0.14	2.79	0.27	5.52	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.14	0.23	0.48	6.62	81.15	93.10	94.03	94.48	99.53								
NTVC-05-16#4	0.0	0.14	2.80	0.34	10.10	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.11	0.12	0.16	0.42	0.55	0.95	7.31	73.97	87.84	89.17	89.90	99.06							
NTVC-05-16#5	0.0	0.13	2.89	0.44	12.76	0.00	0.00	0.00	0.00	0.00	0.14	0.23	0.33	0.45	0.58	0.71	0.83	1.15	4.79	55.08	84.72	86.79	87.24	100.00							
NTVC-05-16#6	0.0	0.13	3.00	0.70	30.65	0.00	0.00	0.00	0.00	0.00	0.19	0.49	0.70	0.82	1.07	1.30	1.50	1.95	2.61	4.07	28.39	58.74	68.83	69.35	96.07						
Cut to -42.0																															
NTVC-05-16 Composite	4.5	0.19	2.36	1.13	5.83	0.00	0.00	0.30	0.77	1.33	1.57	1.81	2.50	3.20	4.12	4.99	6.03	7.82	10.14	15.59	26.82	83.57	92.46	93.78	94.15	99.64					
NTVC-05-17#1	0.7	0.43	1.22	2.02	3.67	4.03	4.03	6.19	7.00	8.66	9.33	10.60	12.71	15.00	17.10	19.05	21.31	25.65	32.03	44.88	70.89	93.76	96.01	96.23	96.33	99.97					
NTVC-05-17#2	5.2	0.18	2.45	0.80	9.20	0.00	0.00	0.71	0.71	0.71	0.72	0.78	0.88	1.14	1.99	4.40	7.64	13.97	29.45	83.86	88.22	90.60	90.80	99.95							
NTVC-05-17#3	0.0	0.15	2.78	0.33	16.54	0.00	0.00	0.00	0.00	0.00	0.08	0.12	0.17	0.24	0.30	0.51	1.07	6.06	71.25	82.10	83.06	83.46	99.87								
NTVC-05-17#4	0.0	0.11	3.15	0.64	20.18	0.00	0.00	0.00	0.00	0.23	0.23	0.31	0.39	0.55	0.83	1.03	1.36	1.69	2.25	3.48	19.13	61.97	74.20	79.82	99.47						
NTVC-05-17 Composite																															
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																															
NTVC-05-18#1	0.0	0.11	3.13	0.43	14.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.22	0.62	2.68	36.77	63.18	80.32	85.43	99.69					
NTVC-05-18#2	0.0	0.11	3.13	0.36	14.14	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04	0.06	0.07	0.10	0.03	0.33	33.08	72.51	81.24	85.86	99.79						
NTVC-05-18#3	0.0	0.13	2.89	0.82	17.08	0.00	0.00	0.00	0.00	0.00	0.33	0.74	1.37	1.86	2.54	3.80	4.98	6.57	7.80	41.26	70.45	79.43	82.92	99.82							
NTVC-05-18 Composite																															
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																															
NTVC-05-19#1	4.0	0.19	2.43	0.53	4.39	0.00	0.00	0.00	0.00	0.00	0.22	0.36	0.56	0.76	0.98	1.18	1.43	1.71	6.34	53.65	91.29	94.87	95.36	95.61	99.88						
NTVC-05-19#2	2.5	0.18	2.51	0.36	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.04	0.07	0.21	1.17	2.59	48.01	90.87	95.60	96.07	96.25	99.88							
NTVC-05-19#3	4.8	0.16	2.61	0.33	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	1.40	33.87	87.63	94.66	95.43	95.55	99.76								
NTVC-05-19#4	4.6	0.14	2.80	0.36	5.95	0.00	0.00	0.00	0.00	0.00	0.06	0.08	0.14	0.20	0.38	0.63	0.89	1.42	5.06	77.34	91.83	93.13	94.05	99.54							
Cut to -54.0																															
NTVC-05-19a Composite	15.9	0.16	2.60	0.43	4.75	0.00	0.00	0.00	0.00	0.00	0.06	0.11	0.17	0.24	0.31	0.42	0.58	0.90	2.84	32.73	86.08	94.04	94.85	95.24	99.75						
NTVC-05-19#1	4.0	0.19	2.43	0.53	4.39	0.00	0.00	0.00	0.00	0.00	0.22	0.36	0.56	0.76	0.98	1.18	1.43	1.71	6.34	53.65	91.29	94.87	95.36	95.61	99.88						
NTVC-05-19#2	1.9	0.18	2.51	0.36	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.04	0.07	0.21	1.17	2.59	48.01	90.87	95.60	96.07	96.25	99.88							
NTVC-05-19#3	0.0	0.16	2.61	0.33	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	1.40	33.87	87.63	94.66	95.43	95.55	99									

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (5 OF 9)																													
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																							PAN
						-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	SAND 2.0	2.5	3.0	3.5	3.75	4.0				
NTVC-05-20#1	1.1	0.22	2.20	0.86	1.34	0.00	0.00	0.00	0.00	0.26	0.42	0.59	1.33	1.92	2.77	3.72	4.97	6.75	9.95	19.77	61.08	94.71	98.27	98.55	98.66	99.96			
NTVC-05-20#2	3.5	0.17	2.53	0.61	7.83	0.00	0.00	0.00	0.30	0.30	0.30	0.33	0.37	0.40	0.87	1.28	1.76	2.30	2.67	4.76	31.56	87.18	91.47	91.88	92.17	99.94			
NTVC-05-20 Composite																													
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																													
NTVC-05-21#1	0.8	0.24	2.08	0.99	2.42	0.00	0.00	0.00	0.18	0.62	0.72	0.86	1.67	2.62	3.78	5.03	7.03	9.92	14.81	25.99	62.07	93.89	97.14	97.45	97.58	99.98			
NTVC-05-21#2	4.7	0.19	2.43	0.73	8.43	0.00	0.00	0.00	0.59	0.59	0.59	0.71	0.93	1.40	2.07	2.77	3.66	4.40	7.39	40.05	86.61	90.75	91.18	91.57	99.86				
NTVC-05-21#3	1.3	0.20	2.30	1.21	10.50	0.00	0.00	0.00	1.46	1.68	1.96	2.22	2.92	4.09	5.29	6.30	7.10	8.30	8.96	10.60	29.18	83.32	88.53	89.20	99.89				
NTVC-05-21#4	0.0	0.15	2.76	0.38	13.08	0.00	0.00	0.00	0.00	0.03	0.10	0.25	0.38	0.47	0.55	0.65	0.87	1.44	4.29	77.41	86.18	86.63	86.92	99.94					
Cut to -46.0																													
NTVC-05-21 Composite	6.8	0.19	2.36	0.88	8.13	0.00	0.00	0.30	0.80	0.87	0.93	1.25	1.73	2.42	3.23	4.10	5.28	6.50	10.19	40.56	86.84	91.08	91.54	91.88	99.88				
NTVC-05-22#1	1.9	0.93	0.11	1.49	1.43	0.00	0.00	0.00	1.73	5.47	7.14	8.94	16.83	24.51	34.09	43.51	54.01	68.11	79.98	88.56	95.58	98.29	98.51	98.52	98.57	100.00			
NTVC-05-22#2	3.6	0.17	2.54	0.54	14.17	0.00	0.00	0.00	0.03	0.03	0.23	0.25	0.40	0.58	0.78	1.11	1.57	2.11	4.58	31.64	80.14	84.07	85.48	85.83	99.90				
NTVC-05-22#3	0.1	0.17	2.58	0.57	14.88	0.00	0.00	0.00	0.00	0.17	0.37	0.87	1.31	1.79	2.19	2.61	3.54	23.11	78.39	84.10	84.76	85.12	99.93						
NTVC-05-22#4	0.0	0.18	2.49	1.08	19.71	0.00	0.00	0.00	1.37	1.42	1.74	1.90	2.22	2.78	3.49	3.90	4.32	4.64	4.91	5.50	11.60	73.81	79.68	80.06	80.29	99.95			
NTVC-05-22 Composite	This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																												
NTVC-05-23#1	0.0	0.89	0.17	2.12	5.20	0.00	0.00	1.34	8.13	15.18	17.26	19.74	25.88	32.62	39.38	44.91	49.13	53.72	57.26	63.03	80.94	92.90	94.48	94.67	94.80	99.99			
NTVC-05-23#2	0.0	0.18	2.46	0.42	3.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.25	0.49	1.12	1.70	6.05	50.73	92.41	95.83	96.19	96.42	99.91			
NTVC-05-23#3	0.0	0.15	2.73	0.26	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.04	0.09	0.16	0.77	11.92	86.61	93.40	93.88	94.20	99.84				
NTVC-05-23#4	0.0	0.14	2.81	0.28	7.77	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.07	0.07	0.10	0.21	3.50	77.31	90.96	91.76	92.23	100.00				
NTVC-05-23#5	0.0	0.14	2.84	0.27	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.07	0.11	0.31	0.73	73.58	89.73	91.03	91.67	100.00						
NTVC-05-23 Composite	This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																												
NTVC-05-24#1	0.7	1.04	-0.06	2.20	1.27	0.00	0.00	3.58	8.62	12.80	18.33	21.21	24.57	30.21	36.01	41.52	46.77	51.44	58.34	64.73	73.23	87.89	97.62	98.60	98.68	98.73	99.97		
NTVC-05-24#2	2.7	0.24	2.06	1.34	12.50	0.00	0.00	0.98	1.42	1.75	2.46	3.43	5.65	8.08	9.26	10.46	11.65	12.84	15.39	15.39	47.82	79.53	85.90	86.97	87.50	100.00			
NTVC-05-24#3	4.1	0.21	2.25	0.72	8.74	0.00	0.00	0.00	0.00	0.00	0.01	1.19	2.29	2.85	3.63	4.79	6.68	12.98	60.75	88.32	90.62	90.94	91.26	99.90					
NTVC-05-24#4	0.5	0.17	2.53	0.42	5.54	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.36	0.41	0.50	0.64	0.94	3.28	42.81	88.33	93.48	94.09	94.46	99.82					
Cut to -45.0																													
NTVC-05-24 Composite	8.0	0.25	1.99	1.34	9.16	0.00	0.31	0.75	1.45	2.08	2.45	2.98	3.81	5.67	7.56	8.70	9.92	11.53	13.48	18.46	57.64	86.17	89.90	90.47	90.84	99.93			
NTVC-05-25#1	1.0	1.39	-0.47	2.61	1.90	10.68	12.29	19.00	24.60	29.73	31.94	34.03	37.96	42.81	47.58	51.05	54.10	58.40	62.90	69.76	85.11	96.53	97.88	98.02	98.10	100.00			
NTVC-05-25#2	5.3	0.20	2.35	0.46	5.09	0.00	0.00	0.00	0.00	0.00	0.03	0.07	0.17	0.55	1.09	1.63	2.76	3.95	63.19	92.12	94.33	94.71	94.91	99.78					
NTVC-05-25#3	1.8	0.18	2.45	0.53	9.76	0.00	0.00	0.00	0.00	0.00	0.14	0.19	0.46	0.67	0.87	1.19	1.60	2.14	5.97	47.07	85.63	89.46	89.94	90.24	99.95				
NTVC-05-25#4	0.0	0.16	2.64	0.40	7.85	0.00	0.00	0.01	0.01	0.01	0.08	0.17	0.29	0.36	0.56	0.78	2.35	25.95	83.66	91.14	91.74	92.15	99.88						
Cut to -45.0																													
NTVC-05-25 Composite	8.1	0.25	2.01	1.41	5.74	1.32	1.52	2.35	3.04	3.67	3.94	4.23	4.75	5.43	6.13	6.86	7.66	8.63	10.05	16.06	62.31	91.22	93.69	94.06	94.27	99.84			
NTVC-05-26#1	1.3	0.62	0.68	1.81	1.96	0.00	0.00	3.50	8.98	10.16	12.68	16.43	20.31	25.00	30.34	36.86	46.51	55.43	67.08	84.84	96.86	97.78	97.92	98.04	99.99				
NTVC-05-26#2	3.2	0.18	2.47	0.57	7.41	0.00	0.00	0.00	0.00	0.00	0.02	0.07	0.53	1.03	1.99	2.95	3.98	7.19	41.99	86.54	91.62	92.21	92.59	99.85					
NTVC-05-26#3	1.7	0.17	2.53	0.60	8.96	0.00	0.00	0.00	0.00	0.00	0.13	0.46	0.93	1.47	2.07	2.60	3.17	5.03	31.49	84.18	89.97	90.67	91.04	99.85					
NTVC-05-26#4	0.0	0.19	2.41	0.94	19.48	0.00	0.00	0.00	0.11	0.28	0.44	1.08	2.04	3.18	4.05	5.08	5.76	6.73	8.13	24.27	74.55	79.63	80.20	80.52	99.86				
NTVC-05-26#5	0.0	0.16	2.65	0.52	11.21	0.00	0.00	0.00	0.06	0.09	0.18	0.40	0.73	0.97	1.39	1.83	2.15	2.85	14.05	82.96	88.20	88.56	88.79	99.73					
NTVC-05-26 Composite	This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																												
NTVC-05-27#1	0.0	0.30	1.73	1.15	1.31	0.00	0.00	0.35	1.01	1.76	2.42	3.74	5.02	6.46	8.00	10.52	16.27	25.48	40.60	84.08	96.07	98.35	98.60	98.69	99.93				
NTVC-05-27#2	0.0	0.21	2.24	0.50	9.36	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.14	0.22	0.40	1.52	5.43	22.23	65.82	87.64	89.94	90.32	9						

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (6 OF 9)																											
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																					PAN
						GRAVEL						GRANULAR						SAND									
						-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0		-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0	
NTVC-06-01#1	0.0	0.31	1.67	1.47	2.35	0.00	0.00	0.00	0.00	1.08	2.31	3.46	5.03	7.98	12.18	15.77	19.20	22.77	27.51	39.98	66.67	87.55	95.92	97.28	97.65	99.96	
NTVC-06-01#2	0.0	0.16	2.65	0.40	12.39	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.15	0.23	0.35	0.46	0.58	0.70	0.94	23.69	78.32	86.56	87.32	87.61	99.99		
NTVC-06-01#3	0.0	2.36	-1.24	2.59	11.92	7.89	11.05	14.41	28.88	37.53	41.21	45.09	51.21	56.30	60.80	63.40	65.76	67.41	68.66	69.86	71.53	78.50	84.91	87.38	88.08	99.74	
NTVC-06-01#4	0.0	0.11	3.17	0.54	20.24	0.00	0.00	0.00	0.00	0.15	0.15	0.26	0.33	0.36	0.43	0.50	0.61	0.78	0.93	2.05	23.62	60.13	74.86	79.76	99.91		
NTVC-06-01#5	0.0	0.13	2.98	0.73	23.63	0.00	0.00	0.00	0.00	0.00	0.10	0.33	0.81	1.19	1.74	2.55	3.65	4.85	6.62	30.50	64.64	72.79	76.37	99.98			
NTVC-06-01#6	0.0	1.08	-0.11	3.10	14.04	0.00	18.42	24.38	27.73	30.34	30.63	32.05	33.79	36.35	39.24	41.74	43.74	45.67	47.44	48.85	50.45	66.58	81.92	84.80	85.96	99.85	
<b>NTVC-06-01 Composite</b>																											
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																											
NTVC-06-02#1	0.0	0.16	2.66	0.38	9.13	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.10	0.19	0.26	0.30	0.43	0.61	1.07	23.17	81.94	89.87	90.58	90.87	99.84	
NTVC-06-02#2	0.0	0.15	2.72	0.36	11.64	0.00	0.00	0.00	0.00	0.05	0.05	0.10	0.17	0.23	0.32	0.42	0.54	0.74	14.76	77.03	87.11	88.00	88.36	99.93			
NTVC-06-02#3	0.0	0.14	2.81	0.65	20.48	0.00	0.00	0.00	0.16	0.31	0.37	0.37	0.53	0.71	0.94	1.10	1.29	1.51	1.78	2.17	4.97	56.09	76.15	78.75	79.52	99.86	
NTVC-06-02#4	0.0	2.99	-1.58	2.97	15.18	21.49	24.51	32.50	38.99	45.43	47.39	50.48	54.79	57.54	59.10	60.17	61.13	61.73	62.26	62.83	64.03	82.68	84.38	84.82	99.92		
NTVC-06-02#5	0.0	0.17	2.53	1.34	31.87	0.00	0.00	0.00	0.00	1.38	1.53	2.22	2.90	3.72	4.04	4.68	5.32	5.99	6.90	8.85	21.03	39.32	58.76	65.90	68.13	99.79	
NTVC-06-02#6	0.0	0.13	3.00	0.71	23.25	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.22	0.52	0.90	1.46	2.28	3.45	4.70	6.52	31.92	59.81	73.51	76.75	99.91		
<b>NTVC-06-02 Composite</b>																											
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																											
NTVC-06-03#1	0.3	0.46	1.12	1.63	4.25	0.00	0.00	0.00	0.00	2.31	3.74	5.48	9.89	14.76	19.63	23.81	28.64	35.20	43.89	54.79	79.41	91.74	94.49	95.39	95.75	99.96	
NTVC-06-03#2	0.4	0.27	1.87	1.80	9.79	0.00	0.00	3.65	4.69	5.52	5.85	6.10	7.18	8.39	9.85	11.12	12.84	15.66	20.82	29.20	54.48	71.58	75.94	88.70	90.21	99.82	
NTVC-06-03#3	1.0	2.64	-1.40	2.97	4.05	30.01	32.82	36.55	42.67	46.50	48.91	50.52	54.02	56.78	59.09	60.50	62.24	64.34	67.21	72.87	83.32	88.87	94.04	95.38	95.95	99.93	
NTVC-06-03#4	3.4	0.19	2.36	0.45	3.98	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.07	0.19	0.29	0.46	0.88	2.20	9.52	67.68	93.11	95.79	96.02	99.04	99.94		
NTVC-06-03#5	5.5	0.18	2.46	0.33	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.06	0.09	0.27	1.92	59.04	92.22	96.74	97.18	97.35	99.96			
NTVC-06-03#6	0.0	0.17	2.53	0.37	7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.13	0.18	0.25	0.32	0.41	1.52	45.03	86.47	91.99	92.44	92.61	99.91		
NTVC-06-03#7	0.0	0.12	3.01	0.60	19.56	0.00	0.00	0.00	0.00	0.12	0.12	0.34	0.43	0.68	0.81	0.93	1.06	1.24	1.55	3.99	38.42	67.68	77.19	80.44	100.00		
<b>NTVC-06-03a Composite</b>																											
Cut to -45.0																											
NTVC-06-03b Composite	10.6	0.25	2.01	1.55	3.52	2.83	3.10	3.59	4.20	4.66	4.94	5.15	5.66	6.12	6.58	6.92	7.35	7.99	9.21	13.58	64.51	91.29	94.47	96.19	96.48	99.95	
NTVC-06-03#1	0.3	0.46	1.12	1.63	4.25	0.00	0.00	0.00	0.00	2.31	3.74	5.48	9.89	14.76	19.63	23.81	28.64	35.20	43.89	54.79	79.41	91.74	94.49	95.39	95.75	99.96	
NTVC-06-03#2	0.4	0.27	1.87	1.80	9.79	0.00	0.00	3.65	4.69	5.52	5.85	6.10	7.18	8.39	9.85	11.12	12.84	15.66	20.82	29.20	54.48	71.58	75.94	88.70	90.21	99.82	
NTVC-06-03#3	1.0	2.64	-1.40	2.97	4.05	30.01	32.82	36.55	42.67	46.50	48.91	50.52	54.02	56.78	59.09	60.50	62.24	64.34	67.21	72.87	83.32	88.87	94.04	95.38	95.95	99.93	
NTVC-06-03#4	3.4	0.19	2.36	0.45	3.98	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.07	0.19	0.29	0.46	0.88	2.20	9.52	67.68	93.11	95.79	96.02	99.04	99.94		
NTVC-06-03#5	5.5	0.18	2.46	0.33	2.65	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.06	0.09	0.27	1.92	59.04	92.22	96.74	97.18	97.35	99.96			
NTVC-06-03#6	4.0	0.17	2.53	0.37	7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.13	0.18	0.25	0.32	0.41	1.52	45.03	86.47	91.99	92.44	92.61	99.91		
NTVC-06-03#7	0.0	0.12	3.01	0.60	19.56	0.00	0.00	0.00	0.00	0.12	0.12	0.34	0.43	0.68	0.81	0.93	1.06	1.24	1.55	3.99	38.42	67.68	77.19	80.44	100.00		
<b>NTVC-06-03b Composite</b>																											
Cut to -49.0																											
NTVC-06-04#1	0.0	0.21	2.24	1.31	16.18	0.00	0.00	0.00	0.40	1.17	1.72	2.23	3.98	4.79	6.19	7.04	8.73	9.96	11.39	11.55	33.92	71.17	81.12	83.20	83.82	99.92	
NTVC-06-04#2	0.0	0.33	1.62	2.00	12.56	0.00	0.00	1.94	3.73	6.01	7.63	8.67	11.28	14.11	17.02	18.81	20.40	21.53	22.54	23.40	48.46	72.73	81.18	86.90	87.44	99.84	
NTVC-06-04#3	0.0	0.19	2.38	0.56	5.52	0.00	0.00	0.00	0.00	0.00	0.09	0.40	0.81	1.10	1.54	2.24	2.94	5.39	65.14	89.12	89.35	94.20	94.48	99.89			
NTVC-06-04#4	0.0	0.16	2.60	0.51	7.12	0.00	0.00	0.00	0.04	0.04	0.09	0.22	0.44	0.75	1.24	1.73	2.19	3.25	28.36	83.78	91.78	92.52	92.88	99.97			
NTVC-06-04#5	0.0	0.16	2.61	0.59	12.58																						

**CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (7 OF 9)**

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (7 OF 9)																										
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	GRANULAR											CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)									
						-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	SAND 2.0	2.5	3.0	3.5	3.75	4.0	PAN
NTVC-06-#1	1.5	0.51	0.98	2.14	7.17	0.00	0.00	0.00	9.88	15.05	16.16	17.62	20.31	21.56	22.82	23.29	24.23	27.24	31.64	41.83	76.77	90.15	92.06	92.55	92.83	99.62
NTVC-06-#2	1.0	0.22	2.16	0.64	7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.27	0.57	1.88	3.46	5.25	8.35	19.75	71.68	90.43	92.27	92.58	92.75	99.95	
NTVC-06-#3	0.5	0.21	2.24	0.55	9.56	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.27	0.73	1.16	1.86	2.98	5.15	12.54	70.33	87.53	89.82	90.26	90.44	99.95	
NTVC-06-#4	4.9	0.17	2.53	0.54	9.50	0.00	0.00	0.00	0.00	0.08	0.16	0.31	0.52	0.76	0.84	0.94	1.24	1.69	3.85	39.49	82.23	89.55	90.19	90.50	99.83	
NTVC-06-#5	0.0	0.22	2.18	1.25	19.64	0.00	0.00	0.00	0.00	0.32	1.05	1.66	3.05	4.55	5.99	7.11	8.26	9.25	10.43	12.71	40.47	73.05	74.36	79.98	80.36	99.94
NTVC-06-#6	0.0	1.62	-0.70	2.39	10.75	0.00	0.00	5.73	17.41	31.10	33.69	37.51	44.68	49.49	53.46	56.61	59.07	61.28	63.13	65.67	75.89	85.42	88.03	88.76	89.25	99.98
NTVC-06-#7	0.0	0.16	2.65	0.86	14.52	0.00	0.00	0.00	0.51	0.73	0.98	1.19	1.35	1.84	2.16	2.42	2.64	2.99	3.22	3.52	9.75	73.03	82.71	85.05	85.48	99.78
Cut to -43.0																										
NTVC-06-#7a Composite	7.9	0.22	2.16	1.22	8.78	0.00	0.00	0.00	1.88	2.86	3.12	3.44	4.07	4.47	4.92	5.25	5.74	6.79	8.44	13.62	52.60	85.11	90.39	90.95	91.22	99.81
NTVC-06-#7b Composite	13.9	0.29	1.78	1.76	10.09	0.00	0.00	0.91	3.82	6.57	7.20	8.06	9.69	10.83	11.88	12.67	13.45	14.53	15.94	19.89	52.78	83.64	88.58	89.58	89.91	99.85
NTVC-06-#7c Composite	6.9	0.21	2.24	0.55	9.56	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.27	0.73	1.16	1.86	2.98	5.15	12.54	70.33	87.53	89.82	90.26	90.44	99.95	
NTVC-06-#7d Composite	6.9	0.17	2.53	0.54	9.50	0.00	0.00	0.00	0.00	0.08	0.16	0.31	0.52	0.76	0.84	0.94	1.24	1.69	3.85	39.49	82.23	89.55	90.19	90.50	99.83	
NTVC-06-#7e Composite	0.0	0.22	2.18	1.25	19.64	0.00	0.00	0.00	0.00	0.32	1.05	1.66	3.05	4.55	5.99	7.11	8.26	9.25	10.43	12.71	40.47	73.05	74.36	79.98	80.36	99.94
NTVC-06-#7f Composite	0.0	1.62	-0.70	2.39	10.75	0.00	0.00	5.73	17.41	31.10	33.69	37.51	44.68	49.49	53.46	56.61	59.07	61.28	63.13	65.67	75.89	85.42	88.03	88.76	89.25	99.98
Cut to -49.0																										
NTVC-06-#7g Composite	13.9	0.29	1.78	1.76	10.09	0.00	0.00	0.91	3.82	6.57	7.20	8.06	9.69	10.83	11.88	12.67	13.45	14.53	15.94	19.89	52.78	83.64	88.58	89.58	89.91	99.85
NTVC-06-#7h Composite	1.5	0.51	0.98	2.14	7.17	0.00	0.00	0.00	9.88	15.05	16.16	17.62	20.31	21.56	22.82	23.29	24.23	27.24	31.64	41.83	76.77	90.15	92.06	92.55	92.83	99.62
NTVC-06-#7i Composite	1.0	0.22	2.16	0.64	7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.27	0.57	1.88	3.46	5.25	8.35	19.75	71.68	90.43	92.27	92.58	92.75	99.95	
NTVC-06-#7j Composite	0.5	0.21	2.24	0.55	9.56	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.27	0.73	1.16	1.86	2.98	5.15	12.54	70.33	87.53	89.82	90.26	90.44	99.95	
NTVC-06-#7k Composite	6.9	0.17	2.53	0.54	9.50	0.00	0.00	0.00	0.00	0.08	0.16	0.31	0.52	0.76	0.84	0.94	1.24	1.69	3.85	39.49	82.23	89.55	90.19	90.50	99.83	
NTVC-06-#7l Composite	0.0	0.22	2.18	1.25	19.64	0.00	0.00	0.00	0.00	0.32	1.05	1.66	3.05	4.55	5.99	7.11	8.26	9.25	10.43	12.71	40.47	73.05	74.36	79.98	80.36	99.94
NTVC-06-#7m Composite	0.0	1.62	-0.70	2.39	10.75	0.00	0.00	5.73	17.41	31.10	33.69	37.51	44.68	49.49	53.46	56.61	59.07	61.28	63.13	65.67	75.89	85.42	88.03	88.76	89.25	99.98
Cut to -45.0																										
NTVC-06-#7n Composite	9.9	0.21	2.24	1.13	8.92	0.00	0.00	0.00	1.50	2.28	2.50	2.78	3.31	3.67	4.08	4.36	4.77	5.67	7.08	11.65	49.95	84.53	90.22	90.79	91.08	99.82
NTVC-06-#8a Composite	1.1	0.26	1.96	1.43	15.54	0.00	0.00	0.43	2.49	3.15	3.78	4.97	5.98	7.29	8.45	10.25	12.67	16.40	24.06	53.25	72.44	80.27	83.05	84.46	100.00	
NTVC-06-#8b Composite	1.7	0.29	1.79	1.33	7.94	0.00	0.00	1.59	2.20	2.44	2.44	2.60	3.38	7.82	10.05	12.86	15.87	19.68	29.12	73.79	88.31	91.41	92.06	92.83	99.83	
NTVC-06-#8c Composite	4.4	0.19	2.41	0.48	7.64	0.00	0.00	0.00	0.00	0.05	0.16	0.36	0.60	0.80	1.00	1.28	1.82	4.61	57.07	88.48	91.84	92.19	92.36	99.91		
NTVC-06-#8d Composite	0.0	0.21	2.27	0.58	15.68	0.00	0.00	0.00	0.22	0.27	0.82	0.99	1.09	1.14	1.57	1.98	2.39	4.95	68.54	81.73	83.56	84.15	84.32	99.92		
NTVC-06-#8e Composite																										
This vibracore is outside of the borrow area. It was therefore excluded from the borrow area composite.																										
NTVC-06-#9a Composite	0.5	0.57	0.80	2.09	6.08	0.00	0.00	6.31	9.02	12.37	13.36	14.55	17.10	20.13	23.24	26.02	30.02	36.39	43.76	51.72	79.78	90.60	92.51	93.65	93.92	99.96
NTVC-06-#9b Composite	4.8	0.22	2.21	0.65	7.95	0.00	0.00	0.00	0.00	0.12	0.20	0.46	0.89	1.30	1.76	2.65	3.97	6.10	14.01	70.92	88.92	91.28	91.83	92.05	99.96	
NTVC-06-#9c Composite	0.8	0.23	2.11	0.70	9.70	0.00	0.00	0.00	0.00	0.09	0.13	0.31	0.66	1.31	1.87	3.11	5.79	11.16	24.41	71.09	87.59	89.62	90.04	90.30	99.95	
NTVC-06-#9d Composite	7.9	0.19	2.42	0.34	7.44	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.08	0.17	0.30	0.56	2.69	62.25	88.31	92.02	92.38	92.56	100.00			
NTVC-06-#9e Composite	2.2	0.17	2.52	0.35	5.63	0.00	0.00	0.00	0.00	0.06	0.06	0.08	0.10	0.10	0.12	0.17	0.24	49.19	87.71	93.68	94.19	94.37	99.97			
Cut to -49.0																										
NTVC-06-#9f Composite	16.2	0.20	2.31	0.67	7.41	0.00	0.00	0.19	0.28	0.38	0.45	0.52	0.69	0.93	1.19	1.47	1.96	2.75	4.01	8.30	64.02	88.44	91.92	92.39	92.59	99.98
NTVC-06-#10a Composite	1.3	0.62	0.68	1.95	1.27	0.00	0.00	3.65	9.65	11.62	12.36	14.33	17.44	20.70	24.71	28.38	33.66	41.05	51.33	63.46	90.18	97.97	98.08	98.71	98.73	99.93
NTVC-06-#10b Composite	3.4	0.21	2.27	0.66	9.32	0.00	0.00	0.00	0.00	0.20	0.43	0.68	1.22	1.67	2.49	3.60	5.43	10.96	67.03	86.83	87.83	90.38	90.68	99.95		
NTVC-06-#10c Composite	5.6	0.18	2.47	0.43	7.14	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.21	0.32	0.46	0.78	3.37	55.78	87.62	87.77	92.61	92.86	99.95		
NTVC-06-#10d Composite	0.0	0.20	2.31	1.38	13.56	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.13	0.16	0.23	0.39	0.66	62.07	87.79	93.79	94.20	94.71	99.96		
Cut to -49.0																										
NTVC-06-#10e Composite	10.3	0.22	2.16	1.05	7.12	0.00	0.00	0.46	1.22	1.47	1.56	1.87	2.34	2.86	3.60	4.25	5.24	6.62	8.70	13.46	63.84	88.67	89.09	92.64	92.88	99.95
NTVC-06-#10f Composite	1.3	0.62	0.68	1.95	1.27	0.00	0.00	3.65	9.65	11.62	12.36	14.33	17.44	20.70	24.71	28.38	33.66	41.05	51.33	63.46	90.18	97.97	98.08	98.71	98.73	99.93
NTVC-06-#10g Composite	3.4	0.21	2.27	0.66	9.32	0.00	0.00	0.00	0.00	0.20	0.43	0.68	1.22	1.67	2.49	3.60	5.43	10.96	67.03	86.83	87.83	90.38	90.68	99.95		
NTVC-06-#10h Composite	7.3	0.18	2.47	0.43	7.14	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.21	0.32	0.46	0.78	3.37	55.78	87.62	87.77	92.61	92.86	99.95		
NTVC-06-#10i Composite	2.3	0.20	2.31	1.38	13.56	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.13	0.16	0.23	0.39	0.66	62.07	87.79	93.79	94.20	94.71	99.96		
Cut to -49.0																										

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (8 OF 9)																										
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																				
						GRAVEL					GRANULAR					SAND					PAN					
NTVC-06-11#1	8.0	0.19	2.40	0.51	7.62	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.35	0.56	0.91	1.29	1.63	2.08	3.65	60.16	86.48	91.33	92.10	92.38	99.91	
NTVC-06-11#2	0.0	0.17	2.58	0.61	14.95	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.80	1.64	2.52	3.13	3.49	3.68	22.49	77.77	84.02	84.71	85.05	99.88		
NTVC-06-11#3	0.0	0.20	2.35	0.99	24.15	0.00	0.00	0.00	0.27	0.48	0.62	1.21	2.23	3.57	4.29	5.21	5.96	6.58	7.55	28.83	70.40	75.05	75.57	75.85	99.94	
Cut to -46.0																										
NTVC-06-11a Composite	8.0	0.19	2.40	0.51	7.62	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.35	0.56	0.91	1.29	1.63	2.08	3.65	60.16	86.48	91.33	92.10	92.38	99.91	
NTVC-06-11#1	8.0	0.19	2.40	0.51	7.62	0.00	0.00	0.00	0.00	0.00	0.06	0.16	0.35	0.56	0.91	1.29	1.63	2.08	3.65	60.16	86.48	91.33	92.10	92.38	99.91	
NTVC-06-11#2	1.0	0.17	2.58	0.61	14.95	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.80	1.64	2.52	3.13	3.49	3.68	22.49	77.77	84.02	84.71	85.05	99.88		
NTVC-06-11#3	0.0	0.20	2.35	0.99	24.15	0.00	0.00	0.00	0.27	0.48	0.62	1.21	2.23	3.57	4.29	5.21	5.96	6.58	7.55	28.83	70.40	75.05	75.57	75.85	99.94	
Cut to -47.0																										
NTVC-06-11b Composite	9.0	0.18	2.44	0.54	7.43	0.00	0.00	0.00	0.00	0.00	0.05	0.14	0.34	0.59	0.99	1.43	1.80	2.24	3.65	55.97	85.51	90.52	91.28	91.57	99.91	
NTVC-06-12#1	0.3	0.34	1.55	1.83	9.97	0.00	0.00	0.00	1.34	3.27	4.09	5.11	8.92	13.79	18.86	21.97	24.26	25.94	27.37	29.73	50.24	77.62	88.37	89.54	90.03	99.90
NTVC-06-12#2	5.7	0.19	2.37	0.48	8.53	0.00	0.00	0.00	0.00	0.00	0.07	0.21	0.35	0.53	0.63	0.84	1.18	2.23	6.12	62.15	87.86	90.70	91.20	91.47	99.85	
NTVC-06-12#3	0.7	0.18	2.49	0.49	6.59	0.00	0.00	0.00	0.00	0.00	0.07	0.28	0.55	0.66	0.93	1.24	1.64	4.53	45.35	87.00	92.51	93.08	93.41	93.96	99.96	
NTVC-06-12#4	0.0	0.18	2.44	0.66	8.72	0.00	0.00	0.00	0.29	0.43	0.48	0.75	1.07	1.38	1.63	1.90	2.17	2.40	4.14	48.21	84.39	90.31	90.96	91.28	99.98	
NTVC-06-12#5	0.0	1.52	-0.60	2.21	7.59	3.25	3.25	15.01	23.20	28.15	33.21	41.98	49.48	55.51	59.50	62.90	65.57	67.49	69.41	74.37	87.69	91.34	91.96	92.41	99.74	
NTVC-06-12#6	0.0	0.17	2.56	0.85	17.53	0.00	0.00	0.00	0.31	0.32	0.32	1.15	1.96	2.61	3.03	3.61	4.02	4.28	4.63	15.56	73.71	81.42	82.11	82.47	99.90	
Cut to -44.0																										
NTVC-06-12a Composite	6.7	0.20	2.34	0.63	8.39	0.00	0.00	0.00	0.06	0.15	0.18	0.29	0.59	0.94	1.35	1.59	1.90	2.29	3.29	7.01	59.86	87.31	90.78	91.32	91.61	99.86
NTVC-06-12#1	0.3	0.34	1.55	1.83	9.97	0.00	0.00	0.00	1.34	3.27	4.09	5.11	8.92	13.79	18.86	21.97	24.26	25.94	27.37	29.73	50.24	77.62	88.37	89.54	90.03	99.90
NTVC-06-12#2	5.7	0.19	2.37	0.48	8.53	0.00	0.00	0.00	0.00	0.00	0.07	0.21	0.35	0.53	0.63	0.84	1.18	2.23	6.12	62.15	87.86	90.70	91.20	91.47	99.85	
NTVC-06-12#3	3.5	0.18	2.49	0.49	6.59	0.00	0.00	0.00	0.00	0.00	0.07	0.28	0.55	0.66	0.93	1.24	1.64	4.53	45.35	87.00	92.51	93.08	93.41	93.96	99.96	
NTVC-06-12#4	0.7	0.18	2.44	0.66	8.72	0.00	0.00	0.00	0.29	0.43	0.48	0.75	1.07	1.38	1.63	1.90	2.17	2.40	4.14	48.21	84.39	90.31	90.96	91.28	99.98	
NTVC-06-12#5	0.0	1.52	-0.60	2.21	7.59	3.25	3.25	15.01	23.20	28.15	33.21	41.98	49.48	55.51	59.50	62.90	65.57	67.49	69.41	74.37	87.69	91.34	91.96	92.41	99.74	
NTVC-06-12#6	0.0	0.17	2.56	0.85	17.53	0.00	0.00	0.00	0.31	0.32	0.32	1.15	1.96	2.61	3.03	3.61	4.02	4.28	4.63	15.56	73.71	81.42	82.11	82.47	99.90	
Cut to -47.5																										
NTVC-06-12b Composite	10.2	0.19	2.39	0.60	7.92	0.00	0.00	0.04	0.12	0.15	0.22	0.46	0.77	1.13	1.34	1.63	2.00	2.78	6.13	55.08	87.03	91.23	91.78	92.08	99.90	
NTVC-06-12#1	0.3	0.34	1.55	1.83	9.97	0.00	0.00	0.00	1.34	3.27	4.09	5.11	8.92	13.79	18.86	21.97	24.26	25.94	27.37	29.73	50.24	77.62	88.37	89.54	90.03	99.90
NTVC-06-12#2	5.7	0.19	2.37	0.48	8.53	0.00	0.00	0.00	0.00	0.00	0.07	0.21	0.35	0.53	0.63	0.84	1.18	2.23	6.12	62.15	87.86	90.70	91.20	91.47	99.85	
NTVC-06-12#3	1.7	0.18	2.49	0.49	6.59	0.00	0.00	0.00	0.00	0.00	0.07	0.28	0.55	0.66	0.93	1.24	1.64	4.53	45.35	87.00	92.51	93.08	93.41	93.96	99.96	
NTVC-06-12#4	0.0	0.18	2.44	0.66	8.72	0.00	0.00	0.00	0.29	0.43	0.48	0.75	1.07	1.38	1.63	1.90	2.17	2.40	4.14	48.21	84.39	90.31	90.96	91.28	99.98	
NTVC-06-12#5	0.0	1.52	-0.60	2.21	7.59	3.25	3.25	15.01	23.20	28.15	33.21	41.98	49.48	55.51	59.50	62.90	65.57	67.49	69.41	74.37	87.69	91.34	91.96	92.41	99.74	
NTVC-06-12#6	0.0	0.17	2.56	0.85	17.53	0.00	0.00	0.00	0.31	0.32	0.32	1.15	1.96	2.61	3.03	3.61	4.02	4.28	4.63	15.56	73.71	81.42	82.11	82.47	99.90	
Cut to -45.0																										
NTVC-06-12c Composite	7.7	0.19	2.36	0.62	8.16	0.00	0.00	0.05	0.13	0.16	0.25	0.52	0.86	1.25	1.47	1.77	2.16	3.08	6.69	57.98	87.27	91.01	91.55	91.84	99.88	
NTVC-06-13#1	0.2	0.21	2.23	1.27	9.53	0.00	0.00	0.00	0.46	1.03	1.20	2.20	4.31	6.49	8.25	10.37	12.12	14.99	18.24	38.39	69.00	88.40	89.87	90.47	99.97	
NTVC-06-13#2	0.7	0.72	0.48	2.36	5.07	0.00	6.90	10.35	13.72	17.72	18.12	19.71	22.35	25.70	29.43	32.72	37.05	42.13	48.13	53.63	76.44	91.88	94.48	94.80	94.93	99.97
NTVC-06-13#3	4.9	0.19	2.43	1.06	11.82	0.00	0.00	0.27	0.27	0.62	1.37	2.75	4.15	5.21	6.21	7.25	8.76	11.84	31.28	67.70	85.55	87.43	88.18	99.96		
NTVC-06-13#4	1.0	1.39	-0.48	2.29	7.63	28.05	28.05	29.69	33.19	35.25	36.19	37.48	39.94	41.86	43.69	44.84	45.96	46.84	48.16	50.32	72.14	86.27	91.19	91.98	92.37	99.95
NTVC-06-13#5	0.0	0.19	2.38	0.42	4.81	0.00	0.00	0.00	0.00	0.00	0.07	0.18	0.35	0.50	0.66	0.85	1.37	5.18	5.20	48.01	83.43	87.88	88.60	88.91	99.83	
NTVC-06-13#6	0.0	0.19	2.39	0.75	11.09	0.00	0.00	0.00	0.17	0.53	0.73	0.91	1.27	1.94	2.42	3.02	3.43	3.95	5.20	48.01	83.43	87.88	88.60	88.91	99.83	
Cut to -47.5																										
NTVC-06-13b Composite	9.7	0.26	1.96	1.76	8.76	2.89	3.39	3.81	4.41	5.06	5.20	5.62	6.49	7.70	8.96	9.94	10.96	12.04	13.58	16.96	49.25	78.47	89.48	90.72	91.24	99.96
NTVC-06-13#1	0.2	0.21	2.23	1.27	9.53	0.00	0.00	0.00	0.46	1.03	1.20	2.20	4.31	6.49	8.25	10.37	12.12	14.99	18.24	38.39	69.00	88.40	89.87	90.47	99.97	
NTVC-06-13#2	0.7	0.72	0.48	2.36	5.07	0.00	6.90	10.35	13.72	17.72																

CUMULATIVE PERCENTS AND COMPUTED DISTRIBUTIONS - NORTH TOPSAIL VIBRACORES (9 OF 9)																												
SAMPLE I. D.	EFFECTIVE LENGTH (ft)	MEAN (mm)	PHI MEAN	PHI SORTING	% SILT	CUMULATIVE PERCENT RETAINED (SIEVES EXPRESSED IN PHI)																						PAN
						GRAVEL						GRANULAR						SAND										
						-4.25	-4.0	-3.50	-3.0	-2.50	-2.25	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	3.75	4.0			
NTVC-06-14#1	2.5	0.20	2.33	0.72	10.37	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.56	1.21	1.81	2.21	2.72	3.40	4.71	10.95	57.94	80.68	88.56	89.28	89.63	99.90		
NTVC-06-14#2	3.8	0.20	2.34	0.49	6.48	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.53	0.72	0.84	1.12	1.45	1.98	5.95	68.42	89.68	92.92	93.34	93.52	99.86			
NTVC-06-14#3	2.2	0.18	2.44	0.68	6.69	0.00	0.00	0.00	0.00	0.27	0.80	0.84	0.91	1.16	1.41	1.64	2.04	2.39	2.75	4.92	46.70	87.63	92.53	93.04	93.31	99.63		
NTVC-06-14#4	0.5	0.17	2.58	0.61	10.22	0.00	0.00	0.06	0.06	0.11	0.11	0.31	0.57	1.03	1.50	1.98	2.49	2.84	3.89	24.29	81.94	88.83	89.50	89.78	99.80			
NTVC-06-14#5	0.0	0.20	2.31	1.27	20.91	0.00	0.00	0.63	0.80	0.92	2.00	3.60	5.00	6.15	6.72	7.39	7.93	8.32	9.00	19.86	72.49	78.26	78.79	79.09	99.97			
Cut to -47.0																												
NTVC-06-14 Composite	9.0	0.19	2.37	0.62	7.82	0.00	0.00	0.00	0.00	0.07	0.20	0.26	0.48	0.88	1.21	1.45	1.84	2.28	2.97	6.97	57.75	86.25	91.39	91.93	92.18	99.81		
NTVC-06-15#1	0.0	0.29	1.80	1.23	1.49	0.00	0.00	1.43	1.82	2.15	2.42	2.71	3.35	4.29	5.70	7.41	10.40	14.84	22.20	38.45	74.85	96.05	98.27	98.46	98.51	99.81		
NTVC-06-15#2	0.0	0.81	0.30	1.98	1.83	0.00	0.00	1.91	9.22	13.68	15.63	17.62	21.33	26.82	33.42	38.84	45.94	53.53	60.71	69.69	89.35	97.34	98.11	98.15	98.17	99.96		
NTVC-06-15#3	0.0	0.27	1.88	1.19	3.98	0.00	0.00	0.00	0.76	1.91	2.29	2.97	4.04	5.12	6.34	7.25	8.91	11.68	16.84	30.53	74.44	93.52	95.77	95.96	96.02	99.74		
NTVC-06-15#4	0.0	0.45	1.14	2.43	8.96	0.00	5.51	9.93	12.85	13.87	14.45	15.44	17.10	19.91	22.49	23.61	24.88	26.14	27.28	31.70	59.74	76.58	88.69	90.63	91.04	99.65		
NTVC-06-15#5	0.0	0.18	2.48	0.61	9.71	0.00	0.00	0.00	0.00	0.15	0.27	0.61	0.94	1.42	2.12	2.81	3.35	5.38	38.00	84.04	89.50	90.03	90.29	99.87				
NTVC-06-15#6	0.0	0.17	2.54	0.63	10.17	0.00	0.00	0.00	0.00	0.06	0.24	0.50	1.04	1.71	2.48	2.94	3.27	4.18	29.78	82.56	88.83	89.50	89.83	100.00				
NTVC-06-15#7	0.0	0.27	1.88	1.67	18.52	0.00	0.00	0.00	0.00	1.46	3.43	5.03	7.53	9.93	12.18	14.02	15.41	16.37	17.04	18.04	30.79	75.92	80.58	81.13	81.48	99.99		
NTVC-06-15 Composite																												
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																												
NTVC-06-16#1	0.0	0.71	0.49	1.78	2.13	0.00	0.00	6.23	8.56	11.37	12.34	13.32	14.73	17.07	20.77	25.79	35.32	50.36	65.89	79.92	92.81	97.28	97.75	97.83	97.87	99.89		
NTVC-06-16#2	0.0	0.18	2.51	0.64	11.29	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.32	0.97	1.86	3.01	3.70	4.21	5.79	29.87	82.65	87.91	88.43	88.71	99.88			
NTVC-06-16#3	0.0	0.25	2.00	1.46	17.98	0.00	0.00	0.00	0.00	1.13	1.57	2.94	5.61	7.85	9.62	10.72	11.81	12.81	13.68	15.39	36.52	77.85	81.40	81.84	82.02	99.68		
NTVC-06-16#4	0.0	0.17	2.56	0.71	8.64	0.00	0.00	0.00	0.00	0.13	0.13	0.43	0.95	1.39	1.85	2.12	2.39	2.58	2.75	3.03	27.71	81.82	90.52	91.14	91.36	99.96		
NTVC-06-16#5	0.0	0.16	2.66	0.50	12.11	0.00	0.00	0.00	0.00	0.15	0.25	0.43	0.62	0.79	0.95	1.12	1.27	1.40	20.54	77.36	86.91	87.64	87.89	99.96				
NTVC-06-16 Composite																												
This vibrocore is outside of the borrow area. It was therefore excluded from the borrow area composite.																												
NTVC-06-17#1	4.2	0.20	2.35	0.90	12.54	0.00	0.00	0.00	0.38	0.55	0.61	0.86	1.63	2.35	2.90	3.23	3.66	4.18	5.14	7.42	46.38	80.52	86.39	87.10	87.46	99.61		
NTVC-06-17#2	2.9	0.29	1.78	1.76	10.18	0.00	0.00	0.00	2.84	5.45	6.28	7.42	9.16	11.26	13.44	14.74	16.01	16.82	17.64	19.51	53.04	79.14	88.26	89.36	89.82	99.77		
NTVC-06-17#3	1.3	0.21	2.28	0.64	7.99	0.00	0.00	0.00	0.00	0.00	0.16	0.50	0.88	1.47	2.10	2.80	3.42	4.24	7.73	68.70	87.82	91.16	91.77	92.01	99.93			
NTVC-06-17#4	0.0	0.22	2.19	0.98	6.65	0.00	0.00	0.00	0.92	0.92	0.92	1.05	3.01	3.71	4.50	5.48	6.21	6.94	10.31	65.57	87.48	92.48	93.09	93.35	99.94			
NTVC-06-17#5	0.0	0.27	1.90	1.64	12.83	0.00	0.00	0.00	3.57	4.80	5.46	6.26	7.64	8.91	10.19	11.24	12.29	13.02	13.63	14.68	50.34	80.24	86.05	86.82	87.17	99.83		
Cut to -47.5																												
NTVC-06-17a Composite	8.4	0.23	2.14	1.27	11.02	0.00	0.00	0.00	1.17	2.16	2.47	3.02	4.05	5.20	6.32	7.03	7.79	8.43	9.32	11.64	52.13	81.17	87.77	88.60	88.98	99.71		
NTVC-06-17#1	4.2	0.20	2.35	0.90	12.54	0.00	0.00	0.00	0.38	0.55	0.61	0.86	1.63	2.35	2.90	3.23	3.66	4.18	5.14	7.42	46.38	80.52	86.39	87.10	87.46	99.61		
NTVC-06-17#2	2.9	0.29	1.78	1.76	10.18	0.00	0.00	0.00	2.84	5.45	6.28	7.42	9.16	11.26	13.44	14.74	16.01	16.82	17.64	19.51	53.04	79.14	88.26	89.36	89.82	99.77		
NTVC-06-17#3	1.8	0.21	2.28	0.64	7.99	0.00	0.00	0.00	0.00	0.00	0.16	0.50	0.88	1.47	2.10	2.80	3.42	4.24	7.73	68.70	87.82	91.16	91.77	92.01	99.93			
NTVC-06-17#4	0.0	0.22	2.19	0.98	6.65	0.00	0.00	0.00	0.92	0.92	0.92	1.05	2.17	3.01	3.71	4.50	5.48	6.21	6.94	10.31	65.57	87.48	92.48	93.09	93.35	99.94		
NTVC-06-17#5	0.0	0.27	1.90	1.64	12.83	0.00	0.00	0.00	3.57	4.80	5.46	6.26	7.64	8.91	10.19	11.24	12.29	13.02	13.63	14.68	50.34	80.24	86.05	86.82	87.17	99.83		
NTVC-06-17b Composite	8.9	0.23	2.14	1.24	10.85	0.00	0.00	0.00	1.10	2.04	2.33	2.86	3.86	4.96	6.05	6.75	7.51	8.14	9.03	11.42	53.06	81.55	87.96	88.78	89.15	99.73		
NTVC-06-18#1	2.2	0.22	2.16	1.45	9.55	0.00	0.00	0.00	0.79	1.27	3.45	6.72	10.40	12.17	13.76	14.97	16.42	19.00	32.39	68.24	88.01	89.68	90.45	99.92				
NTVC-06-18#2	0.8	0.51	0.96	2.56	10.44	0.00	6.10	9.02	10.63	14.01	16.31	17.86	21.52	25.31	28.41	29.54	30.87	31.66	32.48	32.53	48.50	75.46	87.52	89.01	89.56	99.86		
NTVC-06-18#3	3.2	0.19	2.40	0.37	3.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.08	0.19	0.40	1.19	6.54	62.59	93.63	96.22	96.55	96.74	100.00				
NTVC-06-18#4	0.0	0.20	2.35	0.61	12.34	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.23	0.34	0.62	0.97	1.40	1.87	2.44	3.29	7.84	55.89	83.21	86.95	87.43	87.66	99.94	
NTVC-06-18#5	0.0	0.20	2.35	0.92	17.13	0.00	0.00	0.00	0.00	0.00	0.45	0.57	1.34	2.10	3.0													

**APPENDIX 20**

**2004 CPE JET PROBE LOGS OFFSHORE BORROW AREA**

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-01

COORDINATES:  N = 2464886  E = 248930	DATE: 12/16/04  START TIME: 1215  END TIME: 1225		WATER DEPTH: 42  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 18.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-42	0 1 2 3 4 5 6	SEA FLOOR  Fine to Med gravelly sand  Shell and Gravel Layer
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-47.5	7 8 9 10 11 12 13 14 15 16 17	Fine grained Silty Sand
WEATHER: Temps in the mid 40's, clear skies  WIND: DIR: South SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None	-48.5	18 19 20 21 22 23 24	Refusal @ 18.0' Resistant Substrate (Rock)
SAND SAMPLES			
TOP: Munsell Color:			
MID: Munsell Color:			
BOTTOM: Munsell Color:	-60		
TURBIDITY: TOP (0.0' - 6.0'): Mod BOTTOM: (6.0' - 18.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-02

COORDINATES:  N = 2463914  E = 252788	DATE: 12/16/04  START TIME: 1306  END TIME: 1315		WATER DEPTH: 42  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 12.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-42	0	SEA FLOOR
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-44	1	Fine to Med sand
WEATHER: Temps in the mid 40's, clear skies  WIND: DIR: South SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None	-54	2 3 4 5 6 7 8 9 10 11 12	Fine Silty Sand
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:		13 14 15 16 17 18 19 20 21 22 23 24	Refusal @ 12.0' Resistant Substrate (Rock)
TURBIDITY: TOP (0.0' - 2.0'): High BOTTOM: (2.0' - 12.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-03

COORDINATES: <b>N</b> = 2468472 <b>E</b> = 261237	DATE: 12/16/04 <b>START TIME:</b> 1348 <b>END TIME:</b> 1356		WATER DEPTH: 39 <b>TOP DIVER:</b> ML <b>BOTTOM DIVER:</b> KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 10.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-39	0	SEA FLOOR
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		1 2 3 4 5 6	Fine to Med Sand
WEATHER: Temps in the mid 40's, clear skies WIND: DIR: South SPEED: 0-5 Kt WAVES: DIR: N/A HEIGHT: 0-1 Ft. CURRENT: None DIR: N/A SPEED: None	-45.5	7 8 9 10	Fine grained Silty Sand
SAND SAMPLES TOP: Munsell Color: MID: Munsell Color: BOTTOM: Munsell Color:	-49	11 12 13 14 15 16 17 18 19 20 21 22 23 24	Refusal @ 10.0' Resistant Substrate (Rock)
TURBIDITY: TOP (0.0' - 2.0'): High BOTTOM: (2.0' - 10.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-04

COORDINATES:  N = 2468535  E = 264465	DATE: 12/16/04  START TIME: 1432  END TIME: 1441		WATER DEPTH: 35  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 10.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-35	0	SEA FLOOR
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-36	1	Fine to Med Sand
WEATHER: Temps in the mid 40's, clear skies  WIND: DIR: South SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None	-45	2 3 4 5 6 7 8 9 10	Silty Sand With Clay
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:		11 12 13 14 15 16 17 18 19 20 21 22 23 24	Refusal @ 10.0' Resistant Substrate (Rock)
TURBIDITY: TOP (0.0' - 1.0'): High BOTTOM: (1.0' - 10.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-05

COORDINATES:  N = 2471303  E = 264643	DATE: 12/16/04  START TIME: 1513  END TIME: 1517			WATER DEPTH: 35  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 0.2'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-35	0	.....	SEA FLOOR  Fine to Med Sand
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"		1		Refusal @ 0.2'  Resistant Substrate (Rock)
WEATHER: Temps in the mid 40's, clear skies  WIND: DIR: South SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None		2		
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:		3		
TURBIDITY: TOP (0.0' - 0.0'): N/A BOTTOM: (0.0' - 0.0'): N/A		4		
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:	23		
		24		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-06

COORDINATES: <b>N</b> = 2471930 <b>E</b> = 266562	DATE: 12/16/04 <b>START TIME:</b> 1540 <b>END TIME:</b> 1550		<b>WATER DEPTH:</b> 31 <b>TOP DIVER:</b> ML <b>BOTTOM DIVER:</b> KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 20.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-31	0	SEA FLOOR
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"	-33.5	1	Shell Hash with Fine to Med Sand
WEATHER: Temps in the mid 40's, clear skies WIND: DIR: South SPEED: 0-5 Kt WAVES: DIR: N/A HEIGHT: 0-1 Ft. CURRENT: None DIR: N/A SPEED: None	-34	2	Rubble Layer
SAND SAMPLES TOP: Munsell Color: MID: Munsell Color: BOTTOM: Munsell Color:	-37	3	Shelly Sand
TURBIDITY: TOP (0.0' - 6.0'): Mod BOTTOM: (6.0' - 20.0'): High	-51	4-19	Fine Silty Sand
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:	20-24	Refusal @ 20.0' Resistant Substrate (Rock)

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-07

COORDINATES:  N = 2502450  E = 273625	DATE: 12/17/04  START TIME: 1351  END TIME: 1400		WATER DEPTH: 38  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 10.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-38	0	SEA FLOOR
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-40	1	Fine to Med Sand
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None	-48	2	Mix of Shell, Silty Sand, and Peat
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:		3	Refusal @ 10.0' Resistant Substrate (Possibly Clay Layer)
TURBIDITY: TOP (0.0' - 2.0'): High BOTTOM: (2.0' - 10.0'): High		4	
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:	5	
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## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-08

COORDINATES:  N = 2501910  E = 271734	DATE: 12/17/04  START TIME: 1432  END TIME: 1440			WATER DEPTH: 39  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 4.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-39 -39.5	0 1 2 3 4	SEA FLOOR Fine to Med Sand Shell Hash	
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-43	5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24		Refusal @ 4.0' Resistant Substrate (Rock)
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None				
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:				
TURBIDITY: TOP (0.0' - 0.5'): Moderate BOTTOM: (0.5' - 4.0'): Low				
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:			

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-09

COORDINATES: <b>N</b> = 2505263 <b>E</b> = 271603	DATE: 12/17/04 <b>START TIME:</b> 1512 <b>END TIME:</b> 1521		<b>WATER DEPTH:</b> 42 <b>TOP DIVER:</b> ML <b>BOTTOM DIVER:</b> KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 9.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-42	0	SEA FLOOR
	-43	1	Fine to Med Sand
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"	-48	2	Shelly Sand with Large Lithoclasts
WEATHER: Temps in the mid 50's, clear skies WIND: DIR: West SPEED: 0-5 Kt	-51	3	
WAVES: DIR: N/A HEIGHT: 0-1 Ft.		4	
CURRENT: None DIR: N/A SPEED: None		5	
SAND SAMPLES		6	
TOP: Munsell Color:		7	
MID: Munsell Color:		8	
BOTTOM: Munsell Color:		9	
TURBIDITY: TOP (0.0' - 6.0'): Moderate BOTTOM: (6.0' - 9.0'): High		10	Refusal @ 9.0' Resistant Substrate (Rock)
DRAWN BY: KW JOB NO: 4600.13		11	
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## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-10

COORDINATES:  N = 2505659  E = 273781	DATE: 12/17/04  START TIME: 1556  END TIME: 1606		WATER DEPTH: 32  TOP DIVER: ML  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 9.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-32	0	SEA FLOOR
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"	-33	1	Fine to Med Sand
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 0-5 Kt  WAVES: DIR: N/A HEIGHT: 0-1 Ft.  CURRENT: None DIR: N/A SPEED: None	-38	2 3 4 5 6	Sandy Shell Hash, Large Shells, and Cobble Sized Lithoclasts
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:	-41	7 8 9	Fine Silty Sand  Refusal @ 9.0' Resistant Substrate (Rock)
TURBIDITY: TOP (0.0' - 6.0'): Moderate BOTTOM: (6.0' - 9.0'): High		10 11 12 13 14 15 16 17 18 19 20 21 22 23 24	
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-11

COORDINATES: <b>N</b> = 2476159 <b>E</b> = 264429	DATE: 12/18/04 <b>START TIME:</b> 1020 <b>END TIME:</b> 1030		<b>WATER DEPTH:</b> 38 <b>TOP DIVER:</b> RT <b>BOTTOM DIVER:</b> KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 8.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-38 -39 -40	0 1 2 3 4 5 6 7 8	SEA FLOOR Fine to Med Sand Dark Gray Shelly Sand Fine Silty Sand Refusal @ 8.0' Resistant Substrate (Consolidated Silty Sand)
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"			
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 5-10 Kt  WAVES: DIR: Northwest HEIGHT: 1-2 Ft.  CURRENT: None DIR: N/A SPEED: None	-46		
SAND SAMPLES			
TOP: Munsell Color:			
MID: Munsell Color:			
BOTTOM: Munsell Color:			
TURBIDITY: TOP (0.0' - 2.0'): Moderate BOTTOM: (2.0' - 8.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		
		21 22 23 24	

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-12

COORDINATES:  N = 2474983  E = 267344	DATE: 12/18/04  START TIME: 1051  END TIME: 1101		WATER DEPTH: 38  TOP DIVER: RT  BOTTOM DIVER: KW
NOTES	ELEV.	DEPTH	SYMBOL
LENGTH OF PVC PIPE: 20.0'  PENETRATION DEPTH: 13.0'  JET PUMP TYPE: BRIGGS & STRATON 3.0 HP  GAL/HR: 8460  DIAMETER OF PIPE: 1.5"	-38  -39  -41	0  1  2  3  4  5  6  7  8  9  10  11  12  13	SEA FLOOR  Fine to Med Sand  Shelly Silty Sand with Clay  Fine Silty Sand  Shelly Sand with Silt  Refusal @ 13.0' Resistant Substrate (Rock)
SUPPORT VESSEL: ENRICA  POSITIONING: DIFFERENTIAL GPS USCG BEACON  NAVIGATION SYSTEM: "HYPACK"			
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 5-10 Kt  WAVES: DIR: Northwest HEIGHT: 1-2 Ft.  CURRENT: None DIR: N/A SPEED: None		-48  -51	
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:			
TURBIDITY: TOP (0.0' - 3.0'): Moderate BOTTOM: (3.0' - 13.0'): High			
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:		

## JET PROBE LOG

**PROJECT:** North Topsail

**JET PROBE:** NTJP-04-13

COORDINATES: <b>N</b> = 2477363 <b>E</b> = 266757	DATE: 12/18/04 <b>START TIME:</b> 1119 <b>END TIME:</b> 1130	<b>WATER DEPTH:</b> 39 <b>TOP DIVER:</b> RT <b>BOTTOM DIVER:</b> KW
NOTES	ELEV.	DEPTH
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 20.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-39  -40.5  -41.3	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"		SEA FLOOR Med Sand with Shell Hash Rubble Layer with Large Lithoclasts and Shell
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 5-10 Kt  WAVES: DIR: Northwest HEIGHT: 1-2 Ft.  CURRENT: None DIR: N/A SPEED: None		Fine Silty Sand
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:	-59	No Refusal @ 20.0'
TURBIDITY: TOP (0.0' - 2.0'): High BOTTOM: (2.0' - 20.0'): High		
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:	

# JET PROBE LOG

## **PROJECT: North Topsail**

JET PROBE: NTJP-04-14

COORDINATES: N = 2470213 E = 263203	DATE: 12/18/04 START TIME: 1201 END TIME: 1211	WATER DEPTH: 37 TOP DIVER: RT BOTTOM DIVER: KW		
NOTES	ELEV.	DEPTH	SYMBOL	DESCRIPTION
LENGTH OF PVC PIPE: 20.0' PENETRATION DEPTH: 13.0' JET PUMP TYPE: BRIGGS & STRATON 3.0 HP GAL/HR: 8460 DIAMETER OF PIPE: 1.5"	-37	0	SEA FLOOR	
SUPPORT VESSEL: ENRICA POSITIONING: DIFFERENTIAL GPS USCG BEACON NAVIGATION SYSTEM: "HYPACK"	-39	1	Fine to Med Sand	
WEATHER: Temps in the mid 50's, clear skies  WIND: DIR: West SPEED: 5-10 Kt  WAVES: DIR: Northwest HEIGHT: 1-2 Ft.  CURRENT: None DIR: N/A SPEED: None	-40	2	Dark Gray Shell Layer	
SAND SAMPLES  TOP: Munsell Color:  MID: Munsell Color:  BOTTOM: Munsell Color:	-50	3	Fine Silty Sand with Some Clay	
TURBIDITY: TOP (0.0' - 3.0'): Moderate BOTTOM: (3.0' - 13.0'): High		13	Refusal @ 13.0' Resistant Substrate (Rock)	
DRAWN BY: KW JOB NO: 4600.13	CHECKED BY:			

**APPENDIX 21**

**2005 CPE VIBRACORE LOGS OFFSHORE BORROW AREA**



**Coastal Planning & Engineering**  
**2481 N.W. Boca Raton Blvd.**  
**Boca Raton, Florida 33431**  
Phone # 1-561-391-8102

### Legend for Geotechnical Data

- (SP), (SM), etc. Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs is initially based on visual field examinations and are identified on the core logs under the Classification of Materials Description. Final classifications are based on laboratory sieve analyses and are identified on the core logs in the Legend and under Remarks.
- Silty, shelly, etc. The indicated sediment type is present. The estimated percentage indicated by the Unified Soil Classification System descriptive terms selected to describe the sediment.

Definition of descriptive terms		Grain size terms
Clean	Free of silt or clay	Cobbles – above 3”
Very	To a high degree	Gravel – 3” sieve to # 4 sieve
Slightly	To a small degree	Coarse – 3” sieve to $\frac{3}{4}$ ” sieve
Isolated	Limited occurrence	Fine – $\frac{3}{4}$ ” sieve to # 4 sieve
Occasional	Infrequently present	Sand – # 4 sieve to # 200 sieve
Tight	Dense compacted	Coarse - # 4 sieve to # 10 sieve
		Medium - # 10 sieve to # 40 sieve
		Fine - # 40 sieve to # 200 sieve
		Fine – (silt or clay) < # 200 sieve

Proportional definition of descriptive terms	
<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %
Coarse to fine	All sizes
Coarse to medium	10 % fine
Medium to fine	10 % coarse
Coarse	10 % medium and fine
Medium	10 % coarse and fine
Fine	10 % coarse and medium

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



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**2481 N.W. Boca Raton Blvd.**  
**Boca Raton, Florida 33431**  
**Phone # 1-561-391-8102**

### Legend for Geotechnical Data

GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



**Coastal Planning & Engineering**  
2481 N.W. Boca Raton Blvd.  
Boca Raton, Florida 33431  
Phone # 1-561-391-8102

### **Legend for Geotechnical Data**

The naming convention used by Coastal Planning and Engineering incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: vibracore (VC)
- Collection year (yy)
- Identification number
- Sample identification in the case of vibracores
- Composite samples are indicated by COMP following the identification number. COMP represents a composite developed to characterize beach compatible material.

#### **Format examples:**

- A) NTVC-05-05
- B) NTVC-05-08 S#2
- C) NTVC-05-22 COMP

Example A is a vibracore number 5, collected in the North Topsail area in the year 2005.

Example B refers to sample number 2 taken from vibracore number 8, which was collected in the North Topsail area in 2005.

Example C illustrates a composite developed to characterize beach compatible material in vibracore 22, collected in North Topsail in 2005. This material is intended for use in beach construction.

No specific format is followed for area name abbreviations; however, the name of the area is always given in the appendix title page where the data is presented.

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

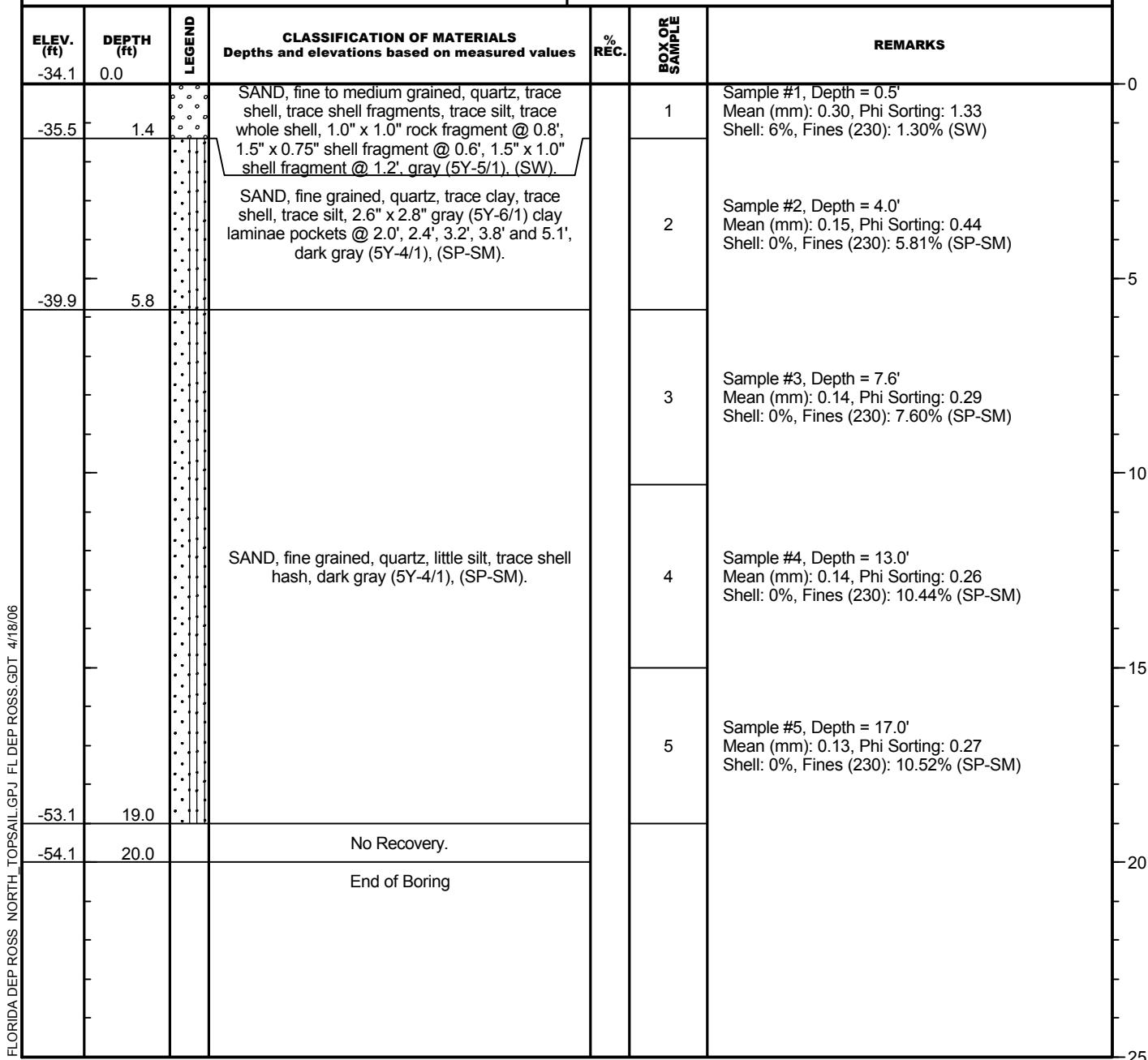
## Boring Designation NTVC-05-01

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-01		LOCATION COORDINATES X = 2,473,072 Y = 266,788		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 06-27-05 12:54	COMPLETED 06-27-05 13:01
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -36.6 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 19.7 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							
ELEV. (ft) -36.6	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-36.6	0.0						
-37.6	1.0		SAND, fine to medium grained, quartz, trace shell hash, trace silt, gray (5Y-5/1), (SP-SM).			1	Sample #1, Depth = 0.5' Mean (mm): 0.19, Phi Sorting: 0.51 Shell: 0%, Fines (230): 7.64% (SP-SM)
-40.7	4.1		SAND, fine grained, quartz, little silt, trace shell hash, 1.0"x 2.0" olive gray (5Y-4/2) clay pocket @ 2.0', gray (5Y-5/1), (SM).			2	Sample #2, Depth = 2.7' Mean (mm): 0.17, Phi Sorting: 0.74 Shell: 1%, Fines (230): 13.46% (SM)
-43.1	6.5		GRAVEL, carbonate, little sand, trace shell hash, trace silt, gravel up to 3.0", dark gray (5Y-4/1), (GW).			VC8#1	
-45.1	8.5		SAND, fine grained, quartz, little silt, trace gravel, trace shell hash, gravel up to 1.0", gray (5Y-5/1), (SM).			3	Sample #3, Depth = 7.6' Mean (mm): 0.15, Phi Sorting: 0.58 Shell: 1%, Fines (230): 18.85% (SM)
-49.0	12.4		SAND, fine grained, quartz, little silt, trace shell hash, dark gray (5Y-4/1), (SM).			4	Sample #4, Depth = 9.0' Mean (mm): 0.15, Phi Sorting: 0.59 Shell: 1%, Fines (230): 15.70% (SM)
-54.4	17.8		SAND, fine to medium grained, quartz, little silt, trace shell fragments, trace shell hash, gray (5Y-5/1), (SM).			5	Sample #5, Depth = 14.5' Mean (mm): 0.14, Phi Sorting: 0.54 Shell: 1%, Fines (230): 15.60% (SM)
-56.3	19.7		GRAVEL, carbonate, little sand, trace silt, gravel up to 3.0", gray (5Y-5/1), (GW).			VC8#1	
-56.6	20.0		No recovery.				
End of Boring							

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

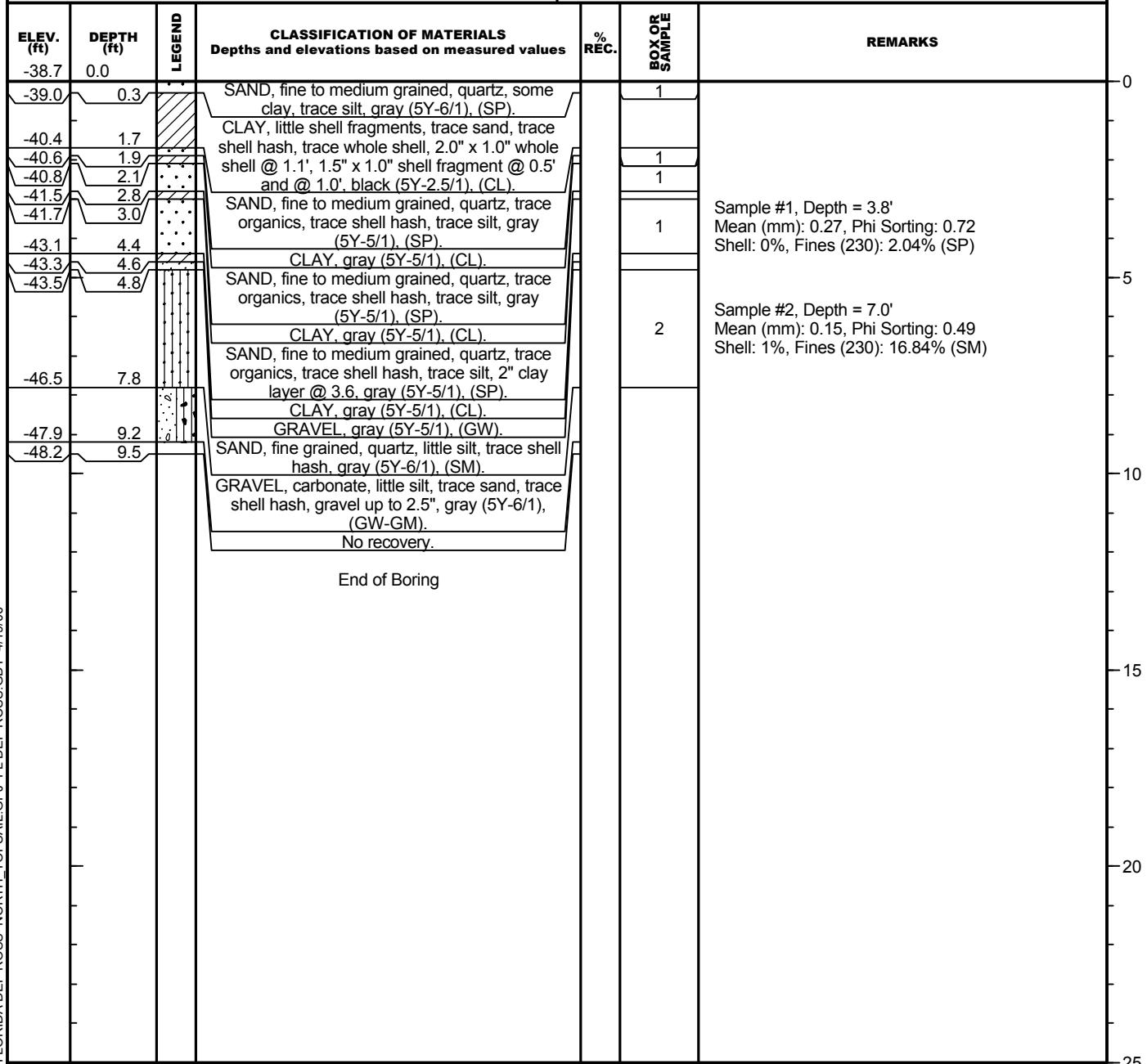
## Boring Designation NTVC-05-02

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
2. BORING DESIGNATION NTVC-05-02		LOCATION COORDINATES X = 2,470,382 Y = 266,097		10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983 VERTICAL NAVD 88
3. DRILLING AGENCY		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Fred Kaub				12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		14. ELEVATION GROUND WATER			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		15. DATE BORING			STARTED 06-27-05 13:58 COMPLETED 06-27-05 14:02
8. TOTAL DEPTH OF BORING		20.0 Ft.		16. ELEVATION TOP OF BORING			-34.1 Ft.
				17. TOTAL RECOVERY FOR BORING			19 Ft.
				18. SIGNATURE AND TITLE OF INSPECTOR			KW



## Boring Designation NTVC-05-03

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
<b>1. PROJECT</b>				9. SIZE AND TYPE OF BIT 3.0 In.	
North Topsail North Topsail, North Carolina				10. COORDINATE SYSTEM/DATUM HORIZONTAL VERTICAL North Carolina State Plane NAD 1983 NAVD 88	
<b>2. BORING DESIGNATION</b> NTVC-05-03		<b>LOCATION COORDINATES</b> X = 2,468,232 Y = 261,899		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
<b>3. DRILLING AGENCY</b>		<b>CONTRACTOR FILE NO.</b>		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)	
<b>4. NAME OF DRILLER</b> Fred Kaub				13. TOTAL NUMBER CORE BOXES	
<b>5. DIRECTION OF BORING</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		<b>DEG. FROM VERTICAL</b>	<b>BEARING</b>	14. ELEVATION GROUND WATER	
<b>6. THICKNESS OF OVERBURDEN</b> 0.0 Ft.				15. DATE BORING STARTED COMPLETED 06-27-05 15:23 06-27-05 15:29	
<b>7. DEPTH DRILLED INTO ROCK</b> 0.0 Ft.				16. ELEVATION TOP OF BORING -38.7 Ft.	
<b>8. TOTAL DEPTH OF BORING</b> 9.5 Ft.				17. TOTAL RECOVERY FOR BORING 9.2 Ft.	
				18. SIGNATURE AND TITLE OF INSPECTOR KW	



## Boring Designation NTVC-05-04

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983 VERTICAL NAVD 88			
2. BORING DESIGNATION NTVC-05-04		LOCATION COORDINATES X = 2,468,814 Y = 258,692		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER			
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)			
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING STARTED COMPLETED 06-27-05 16:15 06-27-05 16:22			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -40.3 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 20 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			
ELEV. (ft) -40.3	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-40.3	0.0						0
-42.6	2.3		SAND, fine grained, quartz, little silt, trace shell hash, 1.0" x 1.0" shell fragments @ 0.4', (2) 1.0" x 1.0" shell fragments @ 0.3', dark gray (5Y-4/1), (SM).			1	Sample #1, Depth = 1.0' Mean (mm): 0.20, Phi Sorting: 0.75 Shell: 1%, Fines (230): 14.75% (SM)
-44.1	3.8		SAND, trace shell hash, trace silt, very dark gray (5Y-3/1), (SP).			2	Sample #2, Depth = 3.0' Mean (mm): 0.19, Phi Sorting: 0.41 Shell: 0%, Fines (230): 2.23% (SP)
-45.8	5.5		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-6/1), (SP).			3	Sample #3, Depth = 5.0' Mean (mm): 0.18, Phi Sorting: 0.38 Shell: 0%, Fines (230): 1.99% (SP)
-47.2	6.9		SAND, trace silt, very dark gray (5Y-3/1), (ML).			VC4#2	
-50.8	10.5		SAND, fine grained, quartz, trace organics, trace shell hash, trace silt, 0.5" silt pockets @ 7.3', 7.5' and 8.3', gray (5Y-5/1), (SP-SM).			5	Sample #5, Depth = 8.0' Mean (mm): 0.16, Phi Sorting: 0.60 Shell: 1%, Fines (230): 7.50% (SP-SM)
-59.3	19.0		SAND, fine grained, quartz, little silt, trace organics, trace shell hash, gray (5Y-5/1), (SM).			6	Sample #6, Depth = 13.0' Mean (mm): 0.16, Phi Sorting: 0.50 Shell: 0%, Fines (230): 15.45% (SM)
-60.3	20.0		Gravely SAND, fine grained, quartz, trace shell hash, trace silt, gravel up to 1.0", gray (5Y-6/1), (SW).			7	Sample #7, Depth = 18.0' Mean (mm): 0.18, Phi Sorting: 0.77 Shell: 1%, Fines (230): 19.89% (SM)
End of Boring							

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## Boring Designation NTVC-05-05

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-05		LOCATION COORDINATES X = 2,474,182 Y = 265,909		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 06-27-05 17:35	COMPLETED 06-27-05 17:38
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.9 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 19.2 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							
ELEV. (ft) -37.9	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-38.3	0.4		GRAVEL, little sand, trace silt, gravel up to 4.0", dark gray (5Y-4/1), (GW).			VC8#1	0 Sample #1, Depth = 1.7' Mean (mm): 0.18, Phi Sorting: 0.47 Shell: 0%, Fines (230): 6.58% (SP-SM)
			SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (5Y-4/1), (SP-SM).			1	5 Sample #2, Depth = 5.7' Mean (mm): 0.18, Phi Sorting: 0.43 Shell: 0%, Fines (230): 5.00% (SP-SM)
-49.9	12.0					2	10 Sample #3, Depth = 11.7' Mean (mm): 0.15, Phi Sorting: 0.32 Shell: 0%, Fines (230): 6.50% (SP-SM)
			SAND, fine grained, quartz, trace shell hash, trace silt, very dark gray (5Y-3/1), (SP-SM).			3	15 Sample #4, Depth = 13.8' Mean (mm): 0.14, Phi Sorting: 0.27 Shell: 0%, Fines (230): 8.62% (SP-SM)
-57.1	19.2		No recovery.			4	20 End of Boring
-57.9	20.0						25

## Boring Designation NTVC-05-06

DRILLING LOG			DIVISION		INSTALLATION			SHEET 1 OF 1 SHEETS	
1. PROJECT North Topsail North Topsail, North Carolina					9. SIZE AND TYPE OF BIT 3.0 In.				
2. BORING DESIGNATION NTVC-05-06			LOCATION COORDINATES X = 2,474,349 Y = 263,846		10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983	VERTICAL NAVD 88
3. DRILLING AGENCY			CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER	<input type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Fred Kaub					12. TOTAL SAMPLES			DISTURBED	UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES				
6. THICKNESS OF OVERTBURDEN 0.0 Ft.					14. ELEVATION GROUND WATER				
7. DEPTH DRILLED INTO ROCK 0.0 Ft.					15. DATE BORING			STARTED 06-27-05 18:12	COMPLETED 06-27-05 18:19
8. TOTAL DEPTH OF BORING 20.0 Ft.					16. ELEVATION TOP OF BORING -37.6 Ft.				
					17. TOTAL RECOVERY FOR BORING 18.4 Ft.				
					18. SIGNATURE AND TITLE OF INSPECTOR KW				
ELEV. (ft) -37.6	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values			% REC.	BOX OR SAMPLE	REMARKS	
-37.6	0.0								
-39.5	1.9		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, 1.0" x 1.0" whole shell @ 1.2'; little shell hash between 0.8'-1.4', gray (5Y-5/1), (SW).				1	Sample #1, Depth = 0.7' Mean (mm): 0.24, Phi Sorting: 0.98 Shell: 3%, Fines (230): 1.62% (SW)	
-49.2	11.6		SAND, fine grained, quartz, trace shell hash, trace silt, 1" x 2" rock fragments @ 2.5', 10.6' and 11.3', 1" x 1" rock fragment @ 4.3', gray (5Y-5/1), (SP-SM).				2	Sample #2, Depth = 6.0' Mean (mm): 0.18, Phi Sorting: 0.58 Shell: 0%, Fines (230): 7.91% (SP-SM)	
-50.7	13.1		SAND, fine grained, quartz, little silt, trace shell hash, 1.0" x 2.0" rock fragment @ 12.8', gray (5Y-5/1), (SM).				3	Sample #3, Depth = 12.0' Mean (mm): 0.20, Phi Sorting: 1.38 Shell: 4%, Fines (230): 13.56% (SM)	
-53.9	16.3		GRAVEL, carbonate, trace sand, trace shell hash, trace silt, gravel up to 4.0", gray (5Y-5/1), (GW).						
-56.0	18.4		SAND, fine grained, quartz, little silt, trace shell hash, 1.0" x 2.0" shell fragment @ 17.5', gray (5Y-5/1), (SM).						
-57.6	20.0		No recovery.						
			End of Boring						
FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06									
25									

## Boring Designation NTVC-05-07

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983			VERTICAL NAVD 88
2. BORING DESIGNATION NTVC-05-07		LOCATION COORDINATES X = 2,475,204 Y = 265,881		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER			
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)			
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERBURDEN		0.0 Ft.		15. DATE BORING STARTED COMPLETED 06-27-05 18:59 06-27-05 19:04			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.3 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 20 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			
ELEV. (ft) -37.3	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-37.3	0.0		SAND, medium to fine grained, quartz, little shell hash, trace silt, 1.0" shell hash layers @ 0.3' and 1.0', gray (5Y-5/1), (SP).			1	Sample #1, Depth = 0.6' Mean (mm): 0.21, Phi Sorting: 0.77 Shell: 1%, Fines (230): 1.55% (SP)
-38.4	1.1		SAND, medium to fine grained, quartz, trace silt, 1.0" x 1.0" silt pockets @ 1.9', 2.9' and 4.1', light olive gray (5Y-6/2), (SP).			2	Sample #2, Depth = 2.5' Mean (mm): 0.19, Phi Sorting: 0.43 Shell: 0%, Fines (230): 3.38% (SP)
-41.7	4.4		SAND, fine grained, quartz, trace silt, gray (5Y-5/1), (SP).			3	Sample #3, Depth = 7.0' Mean (mm): 0.17, Phi Sorting: 0.36 Shell: 0%, Fines (230): 3.56% (SP)
-46.9	9.6		SAND, fine grained, quartz, trace silt, dark gray (5Y-4/1), (SP-SM).			4	Sample #4, Depth = 11.3' Mean (mm): 0.16, Phi Sorting: 0.35 Shell: 0%, Fines (230): 6.15% (SP-SM)
-50.9	13.6		Sandy GRAVEL, carbonate, trace silt, light olive gray (5Y-6/2), (GW).			VC8#1	
-51.3	14.0		SAND, quartz, trace gravel, trace silt, 2.0" x 2.0" rock fragment @ 15.5', light olive gray (5Y-6/2), (SP).			VC2#1	
-53.2	15.9		SAND, fine grained, quartz, trace shell hash, trace silt, light olive gray (5Y-6/2), (SP-SM).			VC9#4	
-57.3	20.0		End of Boring				

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

## Boring Designation NTVC-05-08

DRILLING LOG			DIVISION		INSTALLATION			SHEET 1 OF 1 SHEETS		
1. PROJECT North Topsail North Topsail, North Carolina					9. SIZE AND TYPE OF BIT 3.0 In.					
2. BORING DESIGNATION NTVC-05-08			LOCATION COORDINATES X = 2,474,552 Y = 266,892		10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983 VERTICAL NAVD 88		
3. DRILLING AGENCY			CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER		
4. NAME OF DRILLER Fred Kaub					12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)		
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES					
6. THICKNESS OF OVERTBURDEN 0.0 Ft.					14. ELEVATION GROUND WATER					
7. DEPTH DRILLED INTO ROCK 0.0 Ft.					15. DATE BORING			STARTED 06-27-05 19:35 COMPLETED 06-27-05 19:37		
8. TOTAL DEPTH OF BORING 13.2 Ft.					16. ELEVATION TOP OF BORING -36.5 Ft.					
					17. TOTAL RECOVERY FOR BORING 13.6 Ft.					
					18. SIGNATURE AND TITLE OF INSPECTOR KW					
ELEV. (ft) -36.5	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS			
-37.3	0.8	.	Sandy GRAVEL, some shell hash, trace shell fragments, trace silt, trace whole shell, gravel up to 1.0", dark gray (5Y-4/1), (SW).			1	Sample #1, Depth = 0.5' Mean (mm): 2.10, Phi Sorting: 1.78 Shell: 28%, Fines (230): 1.16% (SW)			
		.	SAND, fine grained, quartz, trace shell hash, trace silt, 1.0" x 1.0" rock fragment @ 1.1' and 2.1', 1" x 2" rock fragment @ 1.8', (2) 3.0" x 2.0" rock fragments @ 11.0', gray (5Y-5/1), (SP-SM).			2	Sample #2, Depth = 3.0' Mean (mm): 0.18, Phi Sorting: 0.50 Shell: 0%, Fines (230): 4.91% (SP-SM)			
		.				3	Sample #3, Depth = 7.0' Mean (mm): 0.17, Phi Sorting: 0.48 Shell: 0%, Fines (230): 7.70% (SP-SM)			
-48.5	12.0	.				4	Sample #4, Depth = 10.6' Mean (mm): 0.18, Phi Sorting: 0.85 Shell: 2%, Fines (230): 9.31% (SP-SM)			
-50.1	13.6	.	GRAVEL, carbonate, little sand, trace silt, some rock fragments up to 5", gray (5Y-6/1), (GW).				End of Boring			
0 5 10 15 20 25										

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

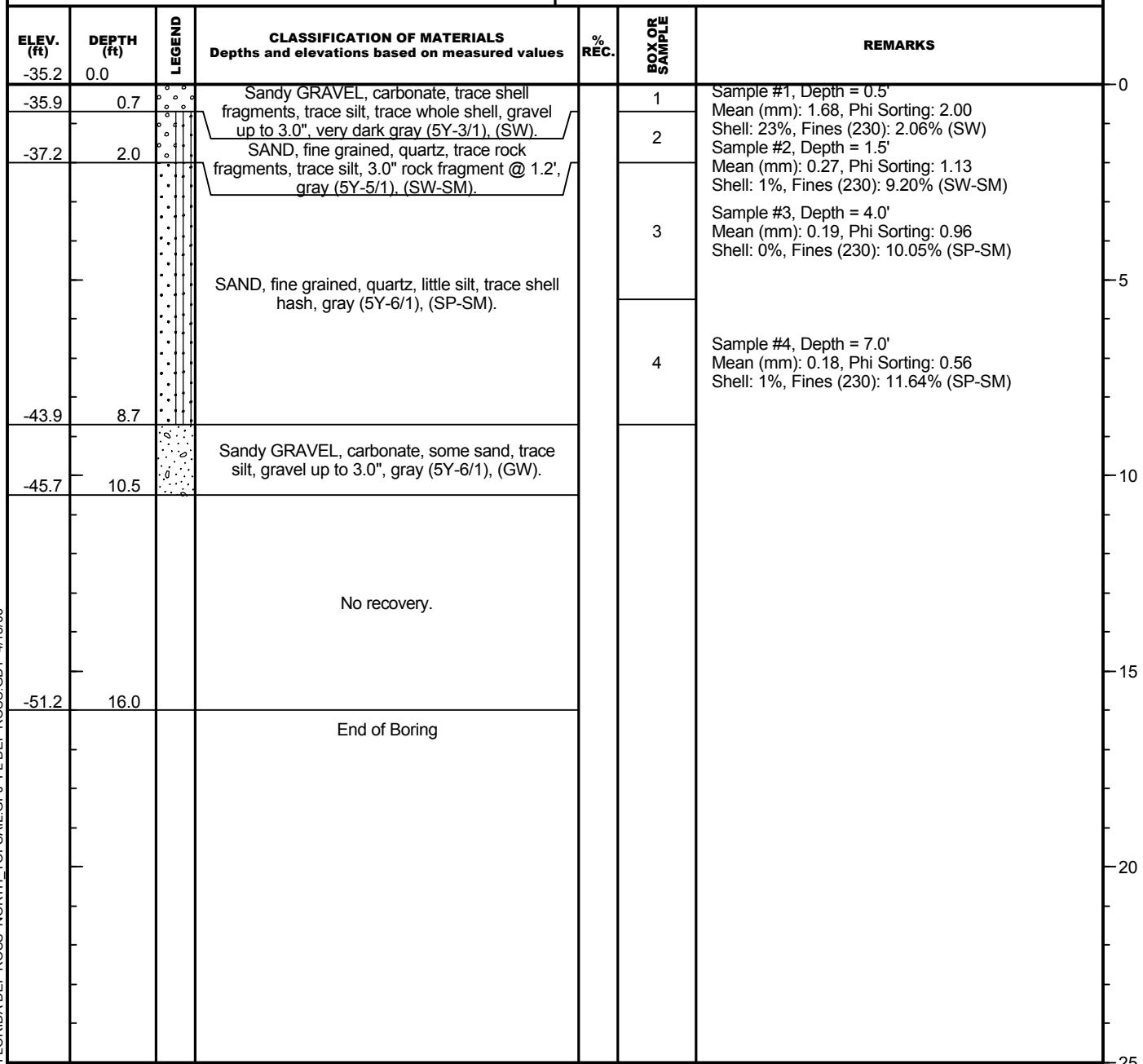
## Boring Designation NTVC-05-09

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-09		LOCATION COORDINATES X = 2,475,445 Y = 266,540		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 06-28-05 08:04	COMPLETED 06-28-05 08:13
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.6 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 20 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							
ELEV. (ft) -37.6	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-37.6	0.0						
-38.8	1.2		SAND, fine grained, quartz, little silt, trace shell hash, 2.0" x 2.0" rock fragment @ 0.8", gray (5Y-5/1), (SW-SM).			1	Sample #1, Depth = 1.0' Mean (mm): 0.21, Phi Sorting: 0.95 Shell: 1%, Fines (230): 7.42% (SW-SM)
						2	Sample #2, Depth = 4.0' Mean (mm): 0.19, Phi Sorting: 0.41 Shell: 0%, Fines (230): 5.41% (SP-SM)
			SAND, fine grained, quartz, trace shell hash, trace silt, (3) 1.0" x 1.0" rocks fragments @ 1.4', 3.2' and 4.0', 3.0" x 3.0" rock fragment @ 1.7', gray (5Y-5/1), (SP-SM).			3	Sample #3, Depth = 7.0' Mean (mm): 0.18, Phi Sorting: 0.43 Shell: 0%, Fines (230): 4.88% (SP-SM)
-47.6	10.0		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-5/1), (SW-SM).			4	Sample #4, Depth = 13.0' Mean (mm): 0.20, Phi Sorting: 1.08 Shell: 3%, Fines (230): 8.32% (SW-SM)
-53.3	15.7		GRAVEL, carbonate, little silt, trace sand, trace shell hash, gravel up to 4.0", gray (5Y-5/1), (GW-GM).				
-57.6	20.0		End of Boring				

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

## Boring Designation NTVC-05-10

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-10		LOCATION COORDINATES X = 2,473,580 Y = 267,791		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 06-28-05 08:41	COMPLETED 06-28-05 08:45
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -35.2 Ft.			
8. TOTAL DEPTH OF BORING		16.0 Ft.		17. TOTAL RECOVERY FOR BORING 10.5 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							

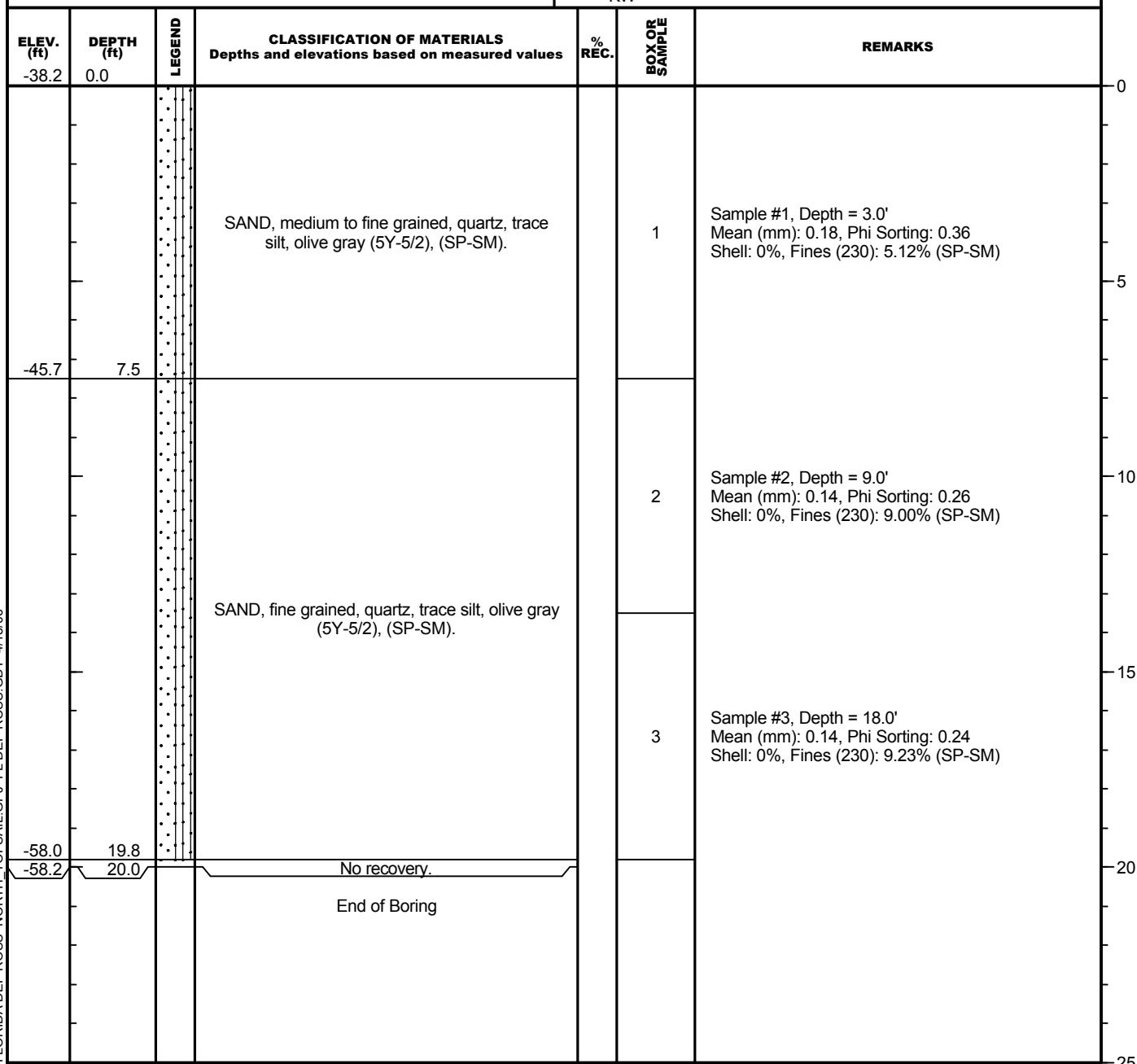


Boring Designation NTVC-05-11

DRILLING LOG		DIVISION		INSTALLATION			SHEET 1 OF 1 SHEETS			
1. PROJECT North Topsail North Topsail, North Carolina					9. SIZE AND TYPE OF BIT 3.0 In.					
2. BORING DESIGNATION NTVC-05-11		LOCATION COORDINATES X = 2,472,569 Y = 266,651			10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983 NAVD 88		
3. DRILLING AGENCY Fred Kaub		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER						
4. NAME OF DRILLER Fred Kaub				12. TOTAL SAMPLES DISTURBED			UNDISTURBED (UD)			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES						
6. THICKNESS OF OVERTBURDEN 0.0 Ft.				14. ELEVATION GROUND WATER						
7. DEPTH DRILLED INTO ROCK 0.0 Ft.				15. DATE BORING 06-28-05 09:05			STARTED 06-28-05 09:05 COMPLETED			
8. TOTAL DEPTH OF BORING 20.0 Ft.				16. ELEVATION TOP OF BORING -36.8 Ft.						
				17. TOTAL RECOVERY FOR BORING 20.4 Ft.						
				18. SIGNATURE AND TITLE OF INSPECTOR KW						
ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS			
-36.8	0.0		SAND, fine grained, quartz, trace shell hash, trace silt, 1.0" x 2.0" rock fragment @ 0.2', very dark gray (5Y-3/1), (SP-SM).		1	1	Sample #1, Depth = 2.3' Mean (mm): 0.17, Phi Sorting: 0.44 Shell: 0%, Fines (230): 4.83% (SP-SM)			
-15.0	9.0								3	Sample #3, Depth = 9.0' Mean (mm): 0.14, Phi Sorting: 0.27 Shell: 0%, Fines (230): 7.70% (SP-SM)
-5.0	18.0									
-57.2	20.4		End of Boring							

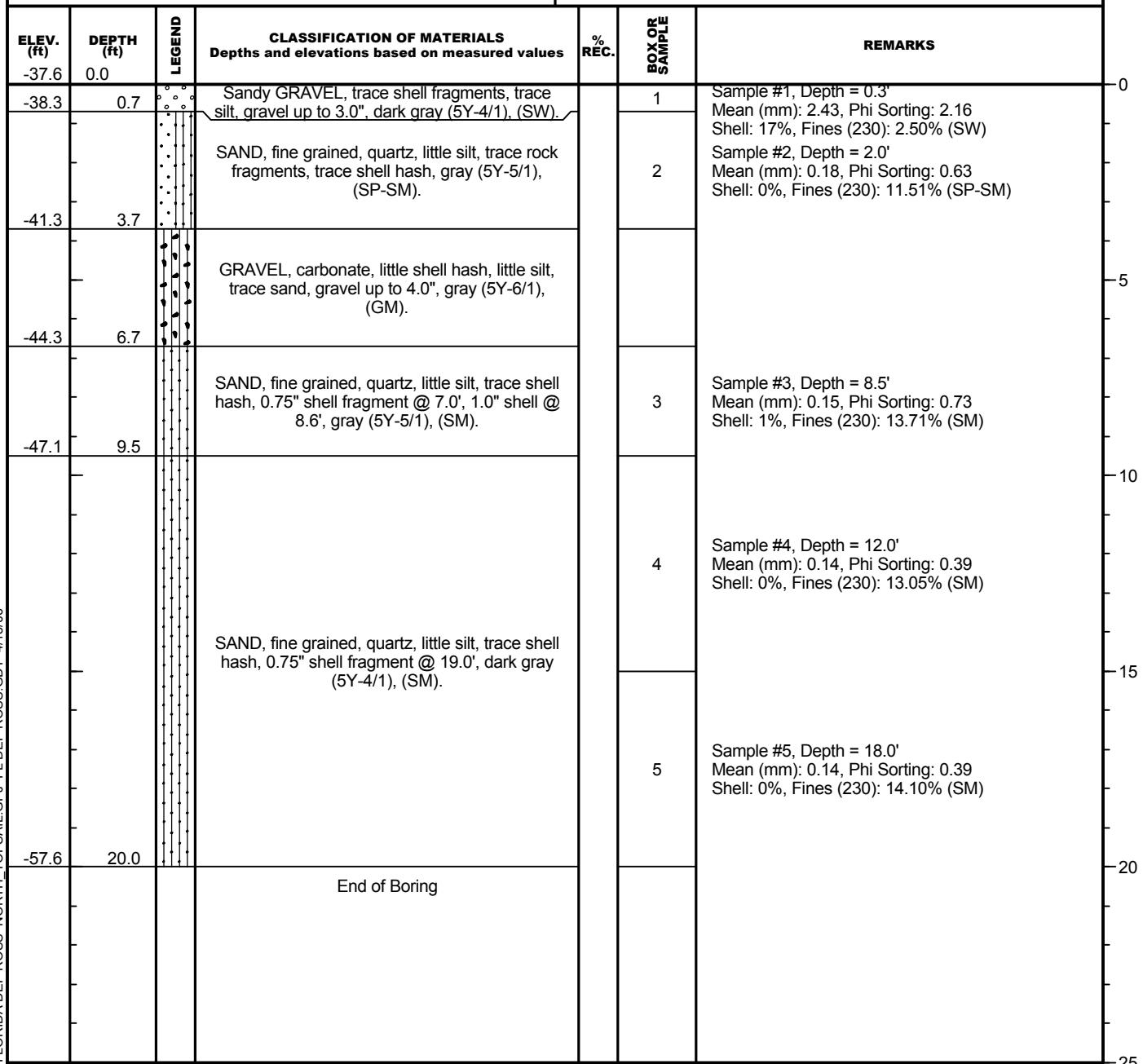
## Boring Designation NTVC-05-12

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983 NAVD 88
2. BORING DESIGNATION NTVC-05-12		LOCATION COORDINATES X = 2,473,184 Y = 265,075		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING			STARTED 06-28-05 09:34 COMPLETED 06-28-05 09:38
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING			-38.2 Ft.
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING			19.8 Ft.
18. SIGNATURE AND TITLE OF INSPECTOR KW							



## Boring Designation NTVC-05-13

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
<b>1. PROJECT</b>		<b>9. SIZE AND TYPE OF BIT</b> 3.0 In.			
North Topsail North Topsail, North Carolina		<b>10. COORDINATE SYSTEM/DATUM</b> North Carolina State Plane		<b>HORIZONTAL</b> NAD 1983	<b>VERTICAL</b> NAVD 88
<b>2. BORING DESIGNATION</b> NTVC-05-13		<b>LOCATION COORDINATES</b> X = 2,472,434 Y = 265,738		<b>11. MANUFACTURER'S DESIGNATION OF DRILL</b> <input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
<b>3. DRILLING AGENCY</b>		<b>CONTRACTOR FILE NO.</b>		<b>12. TOTAL SAMPLES</b>	<b>DISTURBED</b>
				<b>UNDISTURBED (UD)</b>	
<b>4. NAME OF DRILLER</b> Fred Kaub				<b>13. TOTAL NUMBER CORE BOXES</b>	
<b>5. DIRECTION OF BORING</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		<b>DEG. FROM VERTICAL</b>	<b>BEARING</b>	<b>14. ELEVATION GROUND WATER</b>	
<b>6. THICKNESS OF OVERTBURDEN</b> 0.0 Ft.				<b>15. DATE BORING</b>	<b>STARTED</b> 06-28-05 10:05 <b>COMPLETED</b> 06-28-05 10:10
<b>7. DEPTH DRILLED INTO ROCK</b> 0.0 Ft.				<b>16. ELEVATION TOP OF BORING</b> -37.6 Ft.	
<b>8. TOTAL DEPTH OF BORING</b> 20.0 Ft.				<b>17. TOTAL RECOVERY FOR BORING</b> 20 Ft.	
				<b>18. SIGNATURE AND TITLE OF INSPECTOR</b> KW	



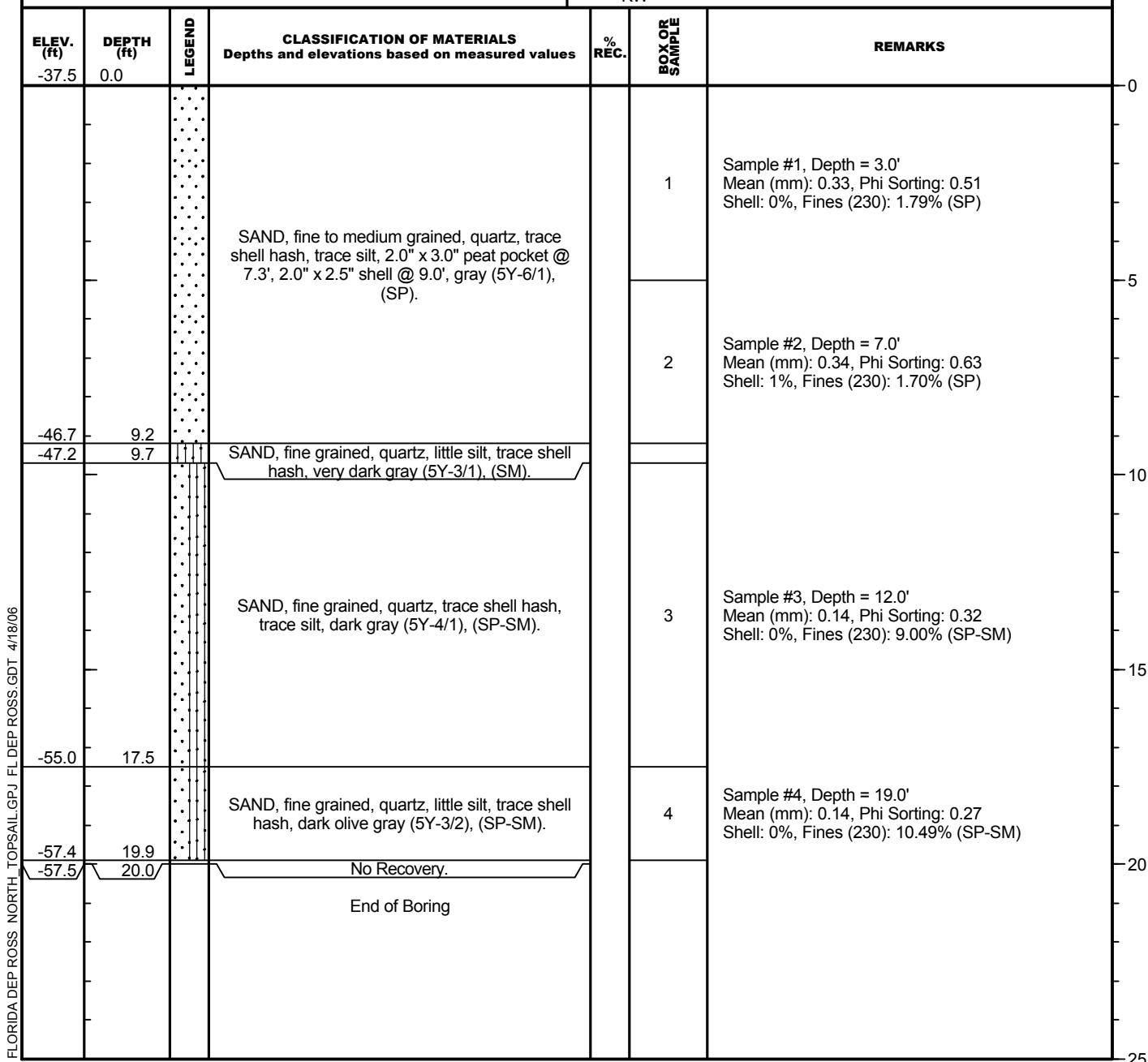
## Boring Designation NTVC-05-14

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983 VERTICAL NAVD 88			
2. BORING DESIGNATION NTVC-05-14		LOCATION COORDINATES X = 2,471,583 Y = 266,453		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER			
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)			
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING STARTED COMPLETED 06-28-05 10:35 06-28-05 10:38			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -35.9 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 19.8 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			
ELEV. (ft) -35.9	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-35.9	0.0		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-5/1), (SP).			1	Sample #1, Depth = 1.0' Mean (mm): 0.22, Phi Sorting: 0.59 Shell: 0%, Fines (230): 2.87% (SP)
-39.9	4.0		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-5/1), (SP-SM).			2	Sample #2, Depth = 7.0' Mean (mm): 0.16, Phi Sorting: 0.36 Shell: 0%, Fines (230): 4.60% (SP-SM)
-45.9	10.0		SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (5Y-4/1), (SP-SM).			3	Sample #3, Depth = 13.0' Mean (mm): 0.14, Phi Sorting: 0.26 Shell: 0%, Fines (230): 6.40% (SP-SM)
-51.0	15.1		SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (5Y-4/1), (SP-SM).			4	Sample #4, Depth = 17.0' Mean (mm): 0.13, Phi Sorting: 0.35 Shell: 0%, Fines (230): 8.21% (SP-SM)
-55.7	19.8		No recovery.				
-55.9	20.0		End of Boring				

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

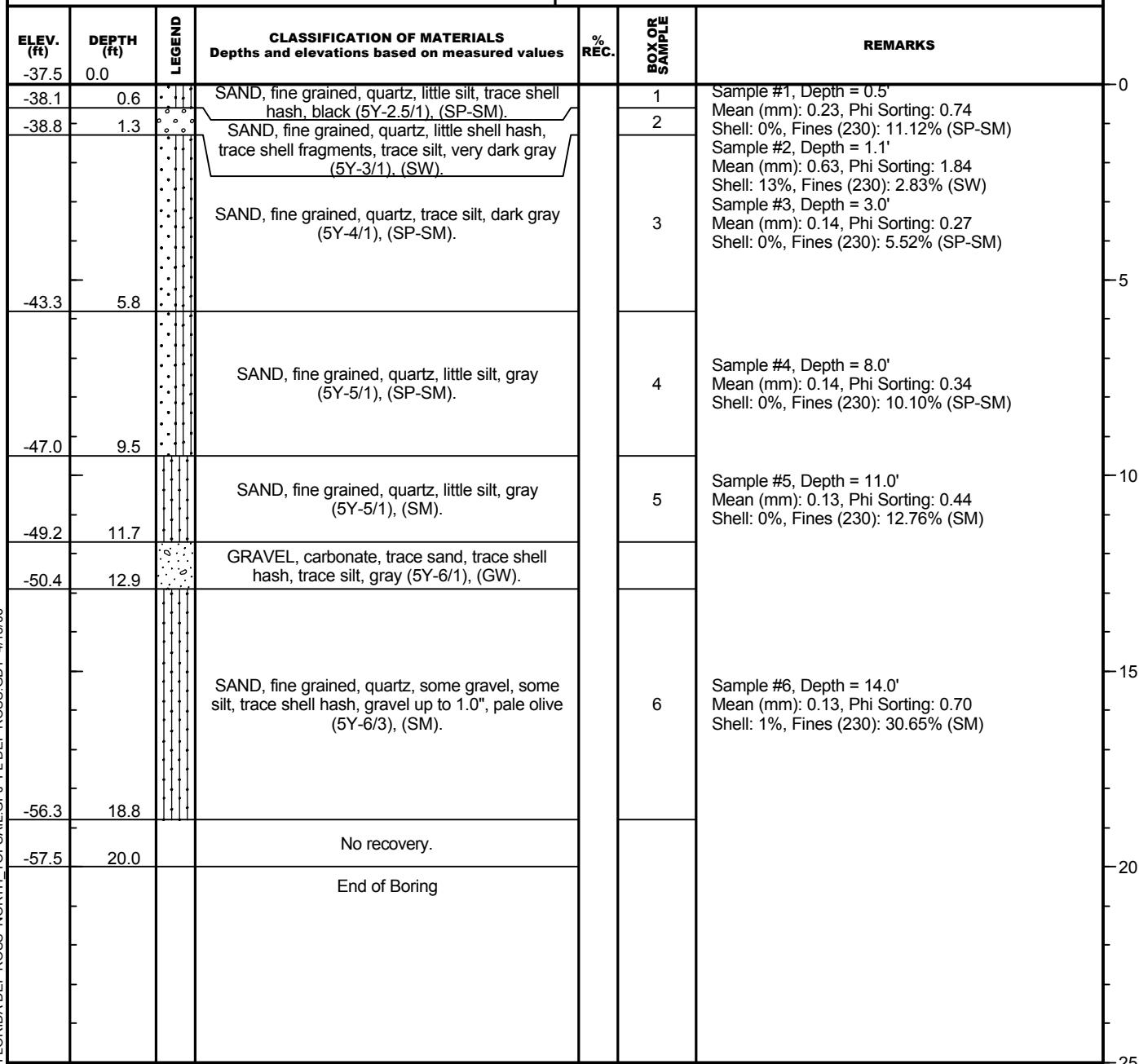
## Boring Designation NTVC-05-15

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>	
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.				
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983	
2. BORING DESIGNATION NTVC-05-15		LOCATION COORDINATES X = 2,469,942 Y = 264,684		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)	
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES				
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER				
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING			STARTED 06-28-05 11:07	COMPLETED 06-28-05 11:10
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING			-37.5 Ft.	
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING			19.9 Ft.	
18. SIGNATURE AND TITLE OF INSPECTOR KW								



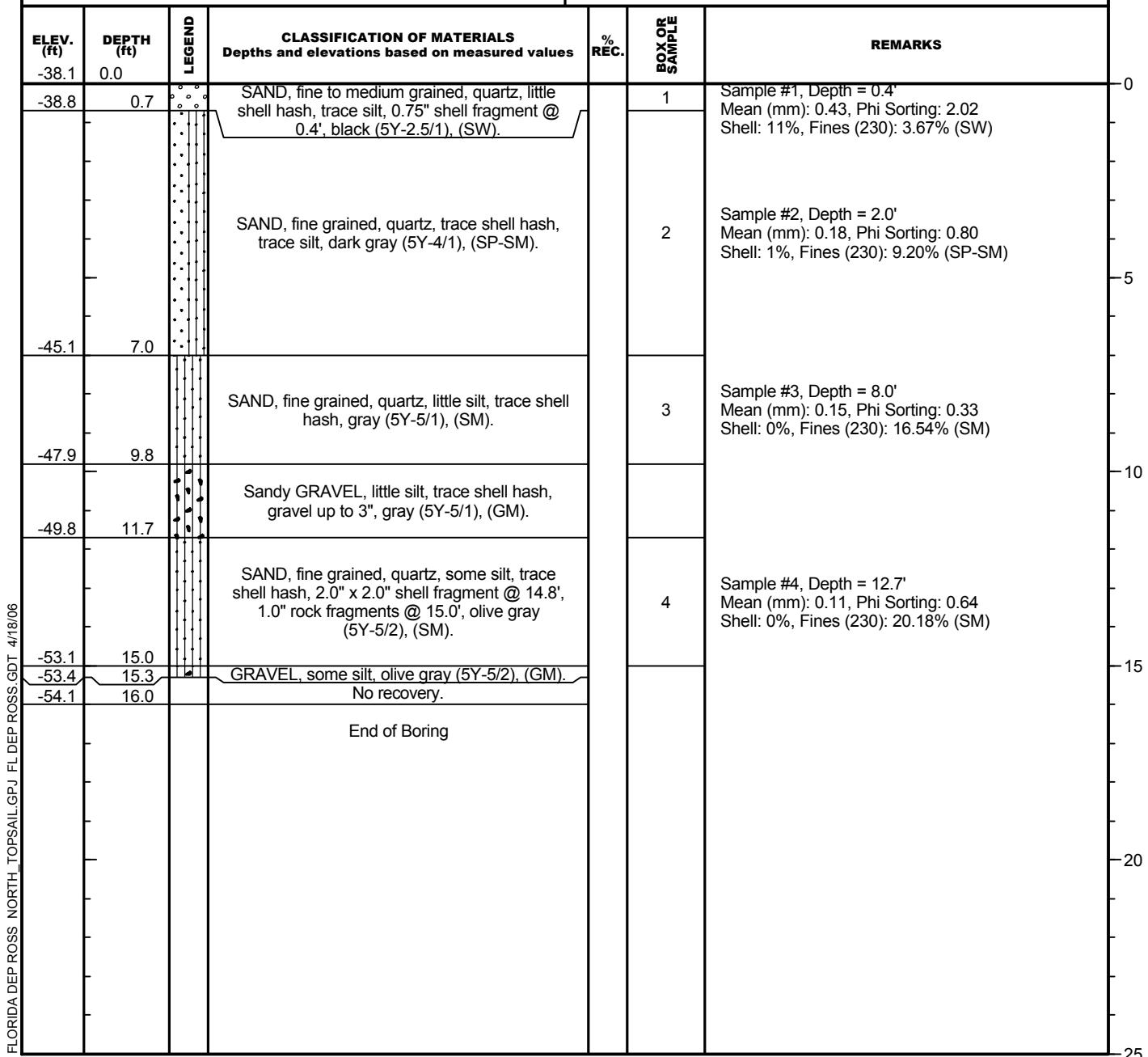
## Boring Designation NTVC-05-16

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
<b>1. PROJECT</b>		<b>9. SIZE AND TYPE OF BIT</b> 3.0 In.			
North Topsail North Topsail, North Carolina		<b>10. COORDINATE SYSTEM/DATUM</b> North Carolina State Plane		<b>HORIZONTAL</b> NAD 1983	<b>VERTICAL</b> NAVD 88
<b>2. BORING DESIGNATION</b> NTVC-05-16		<b>LOCATION COORDINATES</b> X = 2,468,786 Y = 264,883		<b>11. MANUFACTURER'S DESIGNATION OF DRILL</b> <input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
<b>3. DRILLING AGENCY</b>		<b>CONTRACTOR FILE NO.</b>		<b>12. TOTAL SAMPLES</b>	<b>DISTURBED</b>
				<b>UNDISTURBED (UD)</b>	
<b>4. NAME OF DRILLER</b> Fred Kaub				<b>13. TOTAL NUMBER CORE BOXES</b>	
<b>5. DIRECTION OF BORING</b> <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		<b>DEG. FROM VERTICAL</b>	<b>BEARING</b>	<b>14. ELEVATION GROUND WATER</b>	
<b>6. THICKNESS OF OVERTBURDEN</b> 0.0 Ft.				<b>15. DATE BORING</b>	<b>STARTED</b> 06-28-05 11:38 <b>COMPLETED</b> 06-28-05 11:42
<b>7. DEPTH DRILLED INTO ROCK</b> 0.0 Ft.				<b>16. ELEVATION TOP OF BORING</b> -37.5 Ft.	
<b>8. TOTAL DEPTH OF BORING</b> 20.0 Ft.				<b>17. TOTAL RECOVERY FOR BORING</b> 18.8 Ft.	
				<b>18. SIGNATURE AND TITLE OF INSPECTOR</b> KW	



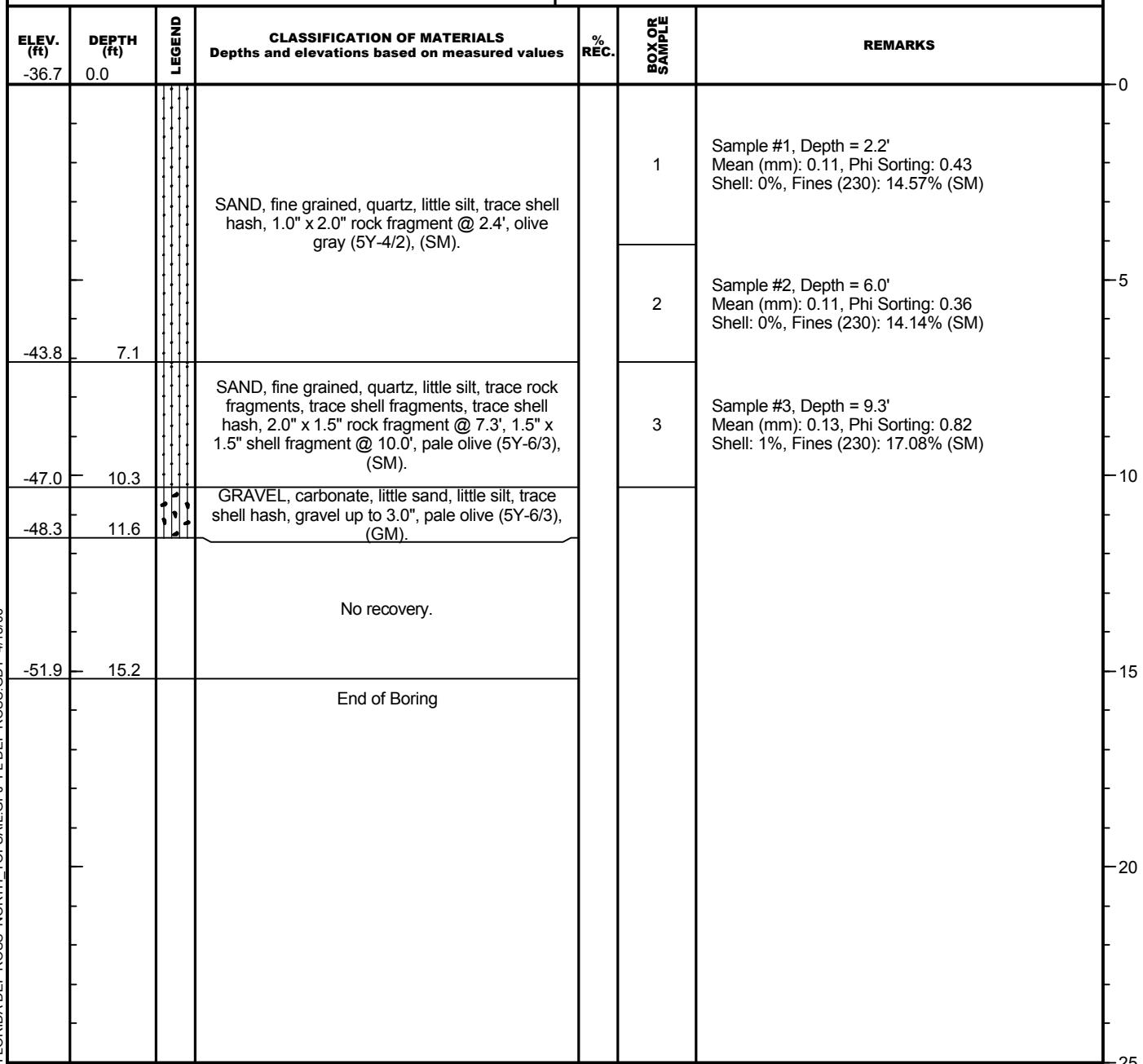
## Boring Designation NTVC-05-17

<b>DRILLING LOG</b>		<b>DIVISION</b>	<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina		CPE North Carolina Division		9. SIZE AND TYPE OF BIT 3.0 In.	
2. BORING DESIGNATION NTVC-05-17		LOCATION COORDINATES X = 2,469,508 Y = 263,272		10. COORDINATE SYSTEM/DATUM HORIZONTAL VERTICAL North Carolina State Plane NAD 1983 NAVD 88	
3. DRILLING AGENCY		CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER	
4. NAME OF DRILLER Fred Kaub				12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)	
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES	
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		14. ELEVATION GROUND WATER	
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		15. DATE BORING STARTED COMPLETED 06-28-05 12:44 06-28-05 12:47	
8. TOTAL DEPTH OF BORING		16.0 Ft.		16. ELEVATION TOP OF BORING -38.1 Ft.	
				17. TOTAL RECOVERY FOR BORING 15.3 Ft.	
				18. SIGNATURE AND TITLE OF INSPECTOR KW	



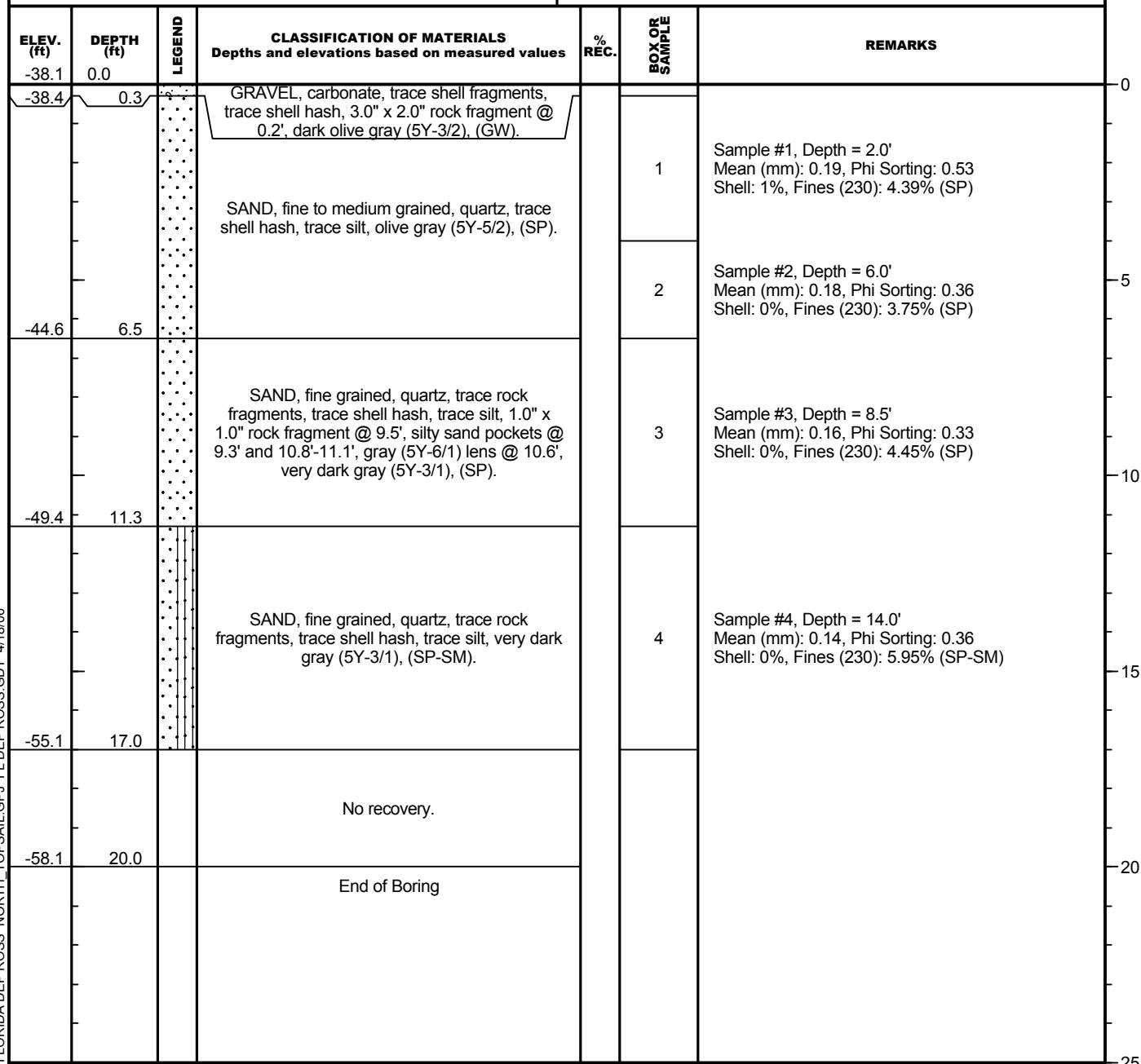
## Boring Designation NTVC-05-18

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-18		LOCATION COORDINATES X = 2,467,905 Y = 264,109		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 06-28-05 14:54	COMPLETED 06-28-05 14:59
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -36.7 Ft.			
8. TOTAL DEPTH OF BORING		15.2 Ft.		17. TOTAL RECOVERY FOR BORING 11.6 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			



## Boring Designation NTVC-05-19

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>	
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.				
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983	
2. BORING DESIGNATION NTVC-05-19		LOCATION COORDINATES X = 2,474,303 Y = 265,013		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)	
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES				
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER				
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING			STARTED 06-28-05 15:36	COMPLETED 06-28-05 15:40
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING			-38.1 Ft.	
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING			17 Ft.	
18. SIGNATURE AND TITLE OF INSPECTOR KW								



## Boring Designation NTVC-05-20

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>	
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.				
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983	
2. BORING DESIGNATION NTVC-05-20		LOCATION COORDINATES X = 2,472,888 Y = 263,919		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES			DISTURBED UNDISTURBED (UD)	
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES				
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER				
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING			STARTED 06-28-05 16:08	COMPLETED 06-28-05 16:15
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING			-38.4 Ft.	
8. TOTAL DEPTH OF BORING		10.0 Ft.		17. TOTAL RECOVERY FOR BORING			10 Ft.	
18. SIGNATURE AND TITLE OF INSPECTOR KW								
ELEV. (ft) -38.4	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS	
-38.4	0.0							
-39.5	1.1		SAND, fine to medium grained, quartz, trace shell hash, trace silt, 1.0" x 2.0" pale olive (5Y-6/3) sand pocket @ 1.5, dark gray (5Y-4/1), (SP).			1	Sample #1, Depth = 0.6' Mean (mm): 0.22, Phi Sorting: 0.86 Shell: 1%, Fines (230): 1.34% (SP)	
-46.7	8.3		SAND, fine grained, quartz, trace rock fragments, trace shell fragments, trace silt, trace whole shell, 1.0" x 1.5" whole shell @ 7.7', pale olive (5Y-6/3), (SP-SM).			2	Sample #2, Depth = 4.5' Mean (mm): 0.17, Phi Sorting: 0.61 Shell: 0%, Fines (230): 7.83% (SP-SM)	
-48.4	10.0		GRAVEL, carbonate, some sand, trace silt, gravel up to 2.0", olive gray (5Y-5/2), (GW).					
End of Boring								

FLORIDA DEP ROSS NORTH TOPSAIL.GPJ FL DEP ROSS.GDT 4/18/06

0  
5  
10  
15  
20  
25

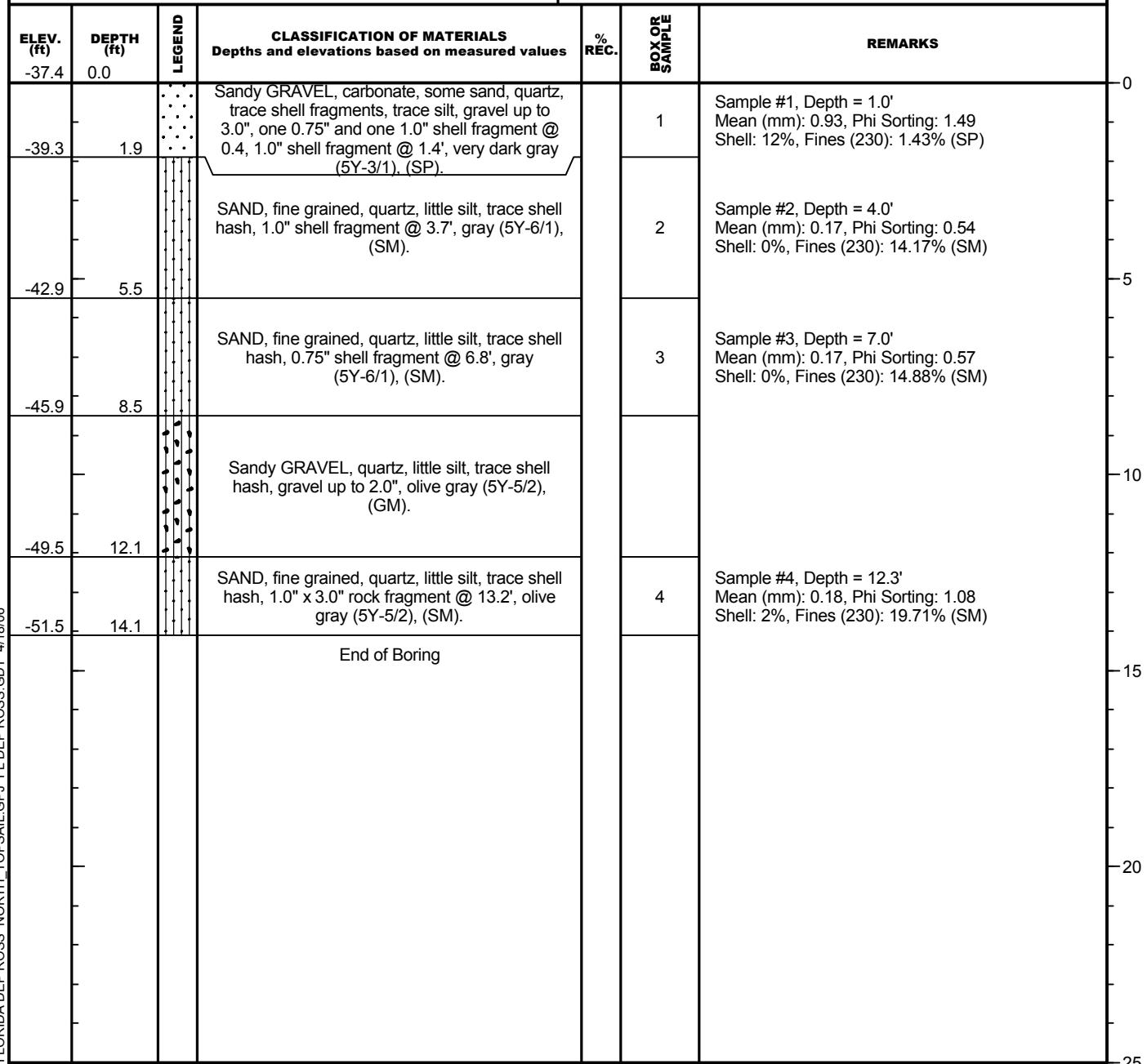
## Boring Designation NTVC-05-21

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983			VERTICAL NAVD 88
2. BORING DESIGNATION NTVC-05-21		LOCATION COORDINATES X = 2,473,489 Y = 263,423		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER			
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)			
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING STARTED COMPLETED 06-28-05 16:44 06-28-05 16:49			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -39.2 Ft.			
8. TOTAL DEPTH OF BORING		18.2 Ft.		17. TOTAL RECOVERY FOR BORING 18.2 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			
ELEV. (ft) -39.2	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-39.7	0.5		SAND, fine grained, quartz, trace shell hash, trace silt, 1.0" olive gray (5Y-5/2) pocket @ 0.2', very dark gray (5Y-3/1), (SW).			1	Sample #1, Depth = 0.4' Mean (mm): 0.24, Phi Sorting: 0.99 Shell: 1%, Fines (230): 2.42% (SW)
-40.0	0.8		Sandy GRAVEL, medium to coarse grained, (2) 1.0" x 1.0" rock fragments @ 0.6', very dark gray (5Y-3/1), (GW).			2	Sample #2, Depth = 4.0' Mean (mm): 0.19, Phi Sorting: 0.73 Shell: 1%, Fines (230): 8.43% (SP-SM)
-44.7	5.5		SAND, fine grained, quartz, trace rock fragments, trace shell hash, trace silt, light olive gray (5Y-6/2), (SP-SM).			3	Sample #3, Depth = 7.0' Mean (mm): 0.20, Phi Sorting: 1.21 Shell: 2%, Fines (230): 10.50% (SW-SM)
-50.9	11.7		SAND, fine grained, quartz, little silt, trace rock fragments, trace shell hash, light olive gray (5Y-6/2), (SW-SM).				
-52.6	13.4		Sandy GRAVEL, some silt, trace shell hash, gravel up to 3.0", light olive gray (5Y-6/2), (GM).				
-57.4	18.2		SAND, fine grained, quartz, little silt, trace shell hash, olive gray (5Y-4/2), (SM).			4	Sample #4, Depth = 16.0' Mean (mm): 0.15, Phi Sorting: 0.38 Shell: 0%, Fines (230): 13.08% (SM)
				End of Boring			

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## Boring Designation NTVC-05-22

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-22		LOCATION COORDINATES X = 2,472,804 Y = 263,217		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 07-01-05 17:25	COMPLETED 07-01-05 17:32
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.4 Ft.			
8. TOTAL DEPTH OF BORING		13.9 Ft.		17. TOTAL RECOVERY FOR BORING 14.1 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							



## Boring Designation NTVC-05-23

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-23		LOCATION COORDINATES X = 2,472,550 Y = 264,980		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 07-01-05 09:29	COMPLETED 07-01-05 09:33
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.0 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 19.1 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							
ELEV. (ft) -37.0	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-37.7	0.7		SAND, fine to medium grained, quartz, trace shell hash, trace silt, little shell hash from 0.3' to 0.5', 2.0" x 2.0" rock fragment @ 0.4', light olive gray (5Y-6/2), (SP-SM).			1	Sample #1, Depth = 0.5' Mean (mm): 0.89, Phi Sorting: 2.12 Shell: 2%, Fines (230): 5.20% (SP-SM)
-42.5	5.5		SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (5Y-4/1), (SP).			2	Sample #2, Depth = 3.0' Mean (mm): 0.18, Phi Sorting: 0.42 Shell: 0%, Fines (230): 3.58% (SP)
-46.8	9.8		SAND, fine grained, quartz, trace shell hash, trace silt, mud lens @ 7.5', dark gray (5Y-4/1), (SP-SM).			3	Sample #3, Depth = 8.0' Mean (mm): 0.15, Phi Sorting: 0.26 Shell: 0%, Fines (230): 5.80% (SP-SM)
-56.1	19.1		SAND, fine grained, quartz, trace shell hash, trace silt, black (5Y-2.5/1), (SP-SM).			4	Sample #4, Depth = 13.0' Mean (mm): 0.14, Phi Sorting: 0.28 Shell: 0%, Fines (230): 7.77% (SP-SM)
-57.0	20.0		No recovery.			5	Sample #5, Depth = 17.0' Mean (mm): 0.14, Phi Sorting: 0.27 Shell: 0%, Fines (230): 8.33% (SP-SM)
End of Boring							

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## Boring Designation NTVC-05-24

DRILLING LOG			DIVISION		INSTALLATION			SHEET 1 OF 1 SHEETS	
1. PROJECT North Topsail North Topsail, North Carolina					9. SIZE AND TYPE OF BIT 3.0 In.				
2. BORING DESIGNATION NTVC-05-24			LOCATION COORDINATES X = 2,476,236 Y = 266,402		10. COORDINATE SYSTEM/DATUM North Carolina State Plane			HORIZONTAL NAD 1983	VERTICAL NAVD 88
3. DRILLING AGENCY Fred Kaub			CONTRACTOR FILE NO.		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER	<input type="checkbox"/> MANUAL HAMMER
4. NAME OF DRILLER Fred Kaub					12. TOTAL SAMPLES			DISTURBED	UNDISTURBED (UD)
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			DEG. FROM VERTICAL	BEARING	13. TOTAL NUMBER CORE BOXES				
6. THICKNESS OF OVERBURDEN 0.0 Ft.					14. ELEVATION GROUND WATER				
7. DEPTH DRILLED INTO ROCK 0.0 Ft.					15. DATE BORING			STARTED 07-01-05 10:41	COMPLETED 07-01-05 10:45
8. TOTAL DEPTH OF BORING 20.0 Ft.					16. ELEVATION TOP OF BORING -37.0 Ft.				
					17. TOTAL RECOVERY FOR BORING 10.2 Ft.				
					18. SIGNATURE AND TITLE OF INSPECTOR KW				
ELEV. (ft) -37.0	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values			% REC.	BOX OR SAMPLE	REMARKS	
-37.0	0.0								
-37.7	0.7		Sandy GRAVEL, medium to coarse grained, carbonate, some shell hash, trace silt, 1.0" x 1.0" rock fragment @ 0.4' and 0.5', very dark gray (5Y-3/1), (GW).				1	Sample #1, Depth = 0.4' Mean (mm): 1.04, Phi Sorting: 2.20 Shell: 13%, Fines (230): 1.27% (SP)	
-40.4	3.4		SAND, fine grained, quartz, little silt, trace shell fragments, trace shell hash, 1.0" x 1.0" rock fragment @ 2.6' and 2.7', gray (5Y-6/1), (SM).				2	Sample #2, Depth = 3.0' Mean (mm): 0.24, Phi Sorting: 1.34 Shell: 3%, Fines (230): 12.50% (SM)	
-47.2	10.2		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, 2.0" x 1.0" rock fragment @ 4.1, 1.0" x 1.0" rock fragments @ 5.3 and 5.5, trace 0.75" echinoderm fragments, gray (5Y-6/1), (SP-SM).				3	Sample #3, Depth = 6.0' Mean (mm): 0.21, Phi Sorting: 0.72 Shell: 0%, Fines (230): 8.74% (SP-SM)	
-57.0	20.0		No recovery.				4	Sample #4, Depth = 9.0' Mean (mm): 0.17, Phi Sorting: 0.42 Shell: 0%, Fines (230): 5.54% (SP-SM)	
			End of Boring						

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## Boring Designation NTVC-05-25

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane NAD 1983 VERTICAL NAVD 88			
2. BORING DESIGNATION NTVC-05-25		LOCATION COORDINATES X = 2,475,723 Y = 267,245		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER			
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)			
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING STARTED COMPLETED 07-01-05 11:10 07-01-05 11:15			
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -36.9 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 12.4 Ft.			
				18. SIGNATURE AND TITLE OF INSPECTOR KW			
ELEV. (ft) -36.9	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-37.9	1.0	• • •	SAND, fine to medium grained, quartz, little shell fragments, little shell hash, trace silt, some gravel up to 3", 1.0" x 1.0" shell fragment @ 0.2", 1.0" x 3.0" rock fragment @ 0.4", 3.0" x 4.0" rock fragment @ 0.9", very dark gray (5Y-3/1), (SW).			1	Sample #1, Depth = 0.6' Mean (mm): 1.39, Phi Sorting: 2.61 Shell: 31%, Fines (230): 1.90% (SW)
		• • •	SAND, fine grained, quartz, trace shell hash, trace silt, 2.0" x 3.0" rock fragment @ 2.3", 1.0" x 1.0" rock fragment @ 3.8", gray (5Y-6/1), (SP-SM).			2	Sample #2, Depth = 4.5' Mean (mm): 0.20, Phi Sorting: 0.46 Shell: 0%, Fines (230): 5.09% (SP-SM)
-48.1	11.2	• • •	SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (5Y-4/1), (SP-SM).			3	Sample #3, Depth = 8.0' Mean (mm): 0.18, Phi Sorting: 0.53 Shell: 0%, Fines (230): 9.76% (SP-SM)
-49.3	12.4	• • •	No recovery.			4	Sample #4, Depth = 12.0' Mean (mm): 0.16, Phi Sorting: 0.40 Shell: 0%, Fines (230): 7.85% (SP-SM)
-56.9	20.0		End of Boring				

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## Boring Designation NTVC-05-26

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>			<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.			
				10. COORDINATE SYSTEM/DATUM		HORIZONTAL North Carolina State Plane	VERTICAL NAD 1983
2. BORING DESIGNATION NTVC-05-26		LOCATION COORDINATES X = 2,472,154 Y = 262,352		11. MANUFACTURER'S DESIGNATION OF DRILL			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES		DISTURBED	UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES			
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER			
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING		STARTED 07-01-05 11:46	COMPLETED 07-01-05 11:52
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -37.3 Ft.			
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 14.5 Ft.			
18. SIGNATURE AND TITLE OF INSPECTOR KW							
ELEV. (ft) -37.3	DEPTH (ft) 0.0	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values		% REC.	BOX OR SAMPLE	REMARKS
-38.6	1.3		SAND, fine to medium grained, quartz, little shell hash, trace silt, 1.0" rock fragment @ 0.9', 0.75" rock fragment @ 1.3', 1.0" shell fragment @ 0.8'. dark gray (5Y-4/1). (SP).			1	Sample #1, Depth = 1.0' Mean (mm): 0.62, Phi Sorting: 1.81 Shell: 15%, Fines (230): 1.96% (SP)
			SAND, fine grained, quartz, trace shell hash, trace silt, 1.0" x 1.0" shell hash pocket @ 2.6', 2.0" x 1.0" rock fragment @ 1.8', gray (5Y-5/1), (SP-SM).			2	Sample #2, Depth = 3.0' Mean (mm): 0.18, Phi Sorting: 0.57 Shell: 0%, Fines (230): 7.41% (SP-SM)
-45.3	8.0		Gravely SAND, little silt, trace shell hash, gravel up to 3.0", gray (5Y-5/1), (SM).			3	Sample #3, Depth = 6.0' Mean (mm): 0.17, Phi Sorting: 0.60 Shell: 0%, Fines (230): 8.96% (SP-SM)
-49.9	12.6					4	Sample #4, Depth = 9.0' Mean (mm): 0.19, Phi Sorting: 0.94 Shell: 1%, Fines (230): 19.48% (SM)
-51.8	14.5		SAND, fine grained, quartz, little silt, trace shell hash, olive gray (5Y-4/2), (SP-SM).			5	Sample #5, Depth = 13.0' Mean (mm): 0.16, Phi Sorting: 0.52 Shell: 0%, Fines (230): 11.21% (SP-SM)
-57.3	20.0		No recovery.				
			End of Boring				

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## Boring Designation NTVC-05-27

<b>DRILLING LOG</b>		<b>DIVISION</b>		<b>INSTALLATION</b>		<b>SHEET 1 OF 1 SHEETS</b>
1. PROJECT North Topsail North Topsail, North Carolina				9. SIZE AND TYPE OF BIT 3.0 In.		
				10. COORDINATE SYSTEM/DATUM HORIZONTAL North Carolina State Plane		VERTICAL NAD 1983 NAVD 88
2. BORING DESIGNATION NTVC-05-27		LOCATION COORDINATES X = 2,503,363 Y = 274,555		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER <input checked="" type="checkbox"/> MANUAL HAMMER		
3. DRILLING AGENCY		CONTRACTOR FILE NO.		12. TOTAL SAMPLES DISTURBED		UNDISTURBED (UD)
4. NAME OF DRILLER Fred Kaub				13. TOTAL NUMBER CORE BOXES		
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER		
6. THICKNESS OF OVERTBURDEN		0.0 Ft.		15. DATE BORING STARTED		COMPLETED
7. DEPTH DRILLED INTO ROCK		0.0 Ft.		16. ELEVATION TOP OF BORING -42.0 Ft.		
8. TOTAL DEPTH OF BORING		20.0 Ft.		17. TOTAL RECOVERY FOR BORING 16.7 Ft.		
			18. SIGNATURE AND TITLE OF INSPECTOR KW			

